Université de Sherbrooke

Functional Performance and Activity and Mobility Profiles Following Total Knee Arthroplasty: A Pilot Study

Par

Cédric Gingras-Hill

Mémoire présenté au Centre universitaire de formation en gérontologie en vue de l'obtention du grade de maître es arts (M.A.) en gérontologie
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DÉDICACE

Je dédie ce travail à ma famille qui m'a toujours encouragé et a crue dans mon parcours vers mon but ultime, même quand j'étais un peu perdu.

"Success is not final, failure is not fatal: it is the courage to continue that counts". - Winston Churchill

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RÉSUMÉ

La majorité des problèmes de genoux nécessitant une arthroplastie totale du genou (ATG) résulte de la présence d'arthrose. En effet, l'arthrose induit de la douleur et affecte la mobilité de cette articulation, limitant donc la sphère de mobilité des patients. On estime que le nombre d'ATG va croitre de façon exponentielle d'ici quelques années. Toutefois, les effets de cette chirurgie sur la vie quotidienne des patients demeurent méconnus. En outre, il est difficile d'évaluer son impact en raison des différents instruments utilisés pour évaluer les profils d'activité et mobilité ainsi que la fonction, après la chirurgie.

L'objectif de cette étude est de décrire les différences qui persistent au niveau de la performance fonctionnelle, d'activité et mobilité, entre trois groupes (pré-ATG, 6-18 mois post-ATG et adultes sains actifs) sur une batterie de mesures (mesures d'auto-évaluation, mesures de performance et mesures écologique (actimétrique). Comme étude pilote, nous avons également évalué la faisabilité du protocole et la variabilité des données. Enfin, nous avons exploré la relation entre les trois types de mesures utilisées dans ce projet de recherche.

Pour ce faire, un devis descriptif corrélationnel a été mis en place avec un total de 28 participants (actifs, n = 12, pré-ATG, n = 6 et post-ATG, n = 10). Des tests de Mann-Whitney U ont été utilisés pour trouver les différences existantes entre les groupes de participants, pour chaque type de mesure. Des corrélations de Spearman's Rho ont été utilisé ensuite pour explorer les relations entre les types de mesures.

Comme prévu, les résultats ont montré que le groupe actif atteint des résultats plus sains dans les trois types de mesures. En majorité, les participants post-ATG ont atteint des scores plus sains que le groupe de pré-ATG.

Fait intéressant, la variable *time not at home active*, ou temps actif non à la maison, mesurée par l'accéléromètre (une mesure écologique), était différente dans tous les groupes de participants et a été corrélée avec d'importantes mesures auto-déclarées (SF-12 physique et le IPAQ) et toutes les mesures fondées sur la performance fonctionnelle. En outre, ce qui est ressorti est le fait que le *questionnaire espace de vie* (mesure auto-déclarée) n'a pas une relation avec la *distance maximale de l'ellipse* ou de *l'air de l'ellipse* (mesures écologiques). Indiquant ainsi que la définition de l'espace de vie, nécessite peut-être d'être redéfinie. Une plus grande étude, à devis longitudinal est nécessaire.

Cette étude a démontré que des informations supplémentaires peuvent être trouvés en ajoutant des mesures écologiques à des mesures auto-déclarées et de performance fonctionnelle lors de l'évaluation PTG.

ABSTRACT

Osteoarthritis is the most common disease causing knee-joint failure, resulting in the need for total knee arthroplasty (TKA). The use of TKA is expected to grow exponentially in the next decade. Despite this, little is known about the effects and impact of this practice, on the daily lives of patients after surgery. Additionally, it is difficult to evaluate its impact because of the different instruments used to assess activity and mobility profiles as well as function, after surgery.

In this study, we described the differences between three groups (pre-TKA, 6-18 months post-TKA and healthy active adults) in terms of functional performance and activity and mobility profiles, on a battery of outcome measures (self-report measures, performance-based measures and ecological measures). As a pilot study, we also assessed the feasibility and variability encountered in the study. Finally, we explored the relationship between the three types of measures used in this research project.

To do so, we applied a descriptive correlational design on 28 participants (active, n = 12, pre-TKA, n = 6 and post-TKA, n = 10). Mann-Whitney U tests were applied between groups for each type of measure, to identify significant differences. Spearman's Rho correlations were applied to the types of measures to explore the relationships among them.

As expected, the results showed that the active group reached healthier results in all three types of measures. For the most part, the post-TKA participants reached healthier scores than the pre-TKA group.

Interestingly, the *time not at home active* variable, measured by accelerometer (an ecological measure). Was different among all groups of participants and was correlated with important self-reported measures (SF-12 physical and the IPAQ) and all performance-based measures. Additionally what stood out was the fact the *life-space questionnaire* (self-

reported measure) did not have a relationship with *ellipse maximum distance* or *ellipse area* (ecological measures). Thereby indicating that the definition of life-space may need to be considered again, with a possibility of change. A larger study with a longitudinal design is highly recommended.

This study demonstrated the additional information that can be found by adding ecological measures to self-reported and performance-based measures when evaluating TKA.

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ABBREVIATIONS

6MWT	Six-Minute Walk Test
ADL	Activities of Daily Living
BMI	Body Mass Index
CI	Confidence interval
CST	Chair Stand Test
CVD	Cardiovascular disease
EE	Energy Expenditure
FCI	Functional Comorbidity Index
GDS	Geriatric Depression Scale
GPS	Global positioning system
HALE	Health-Adjusted Life Expectancy
ICC	Intraclass Correlation Coefficient
ICF	International Classification of Functioning, Disability, and Health
IPAQ	International Physical Activity Questionnaire
KOOS	Knee Injury and Osteoarthritis Outcome Score
KOS-ADLS	Knee Outcome Survey-Activities of Daily Living Scale
LEFS	Lower Extremity Functional Scale
LSA	Life-Space Assessment
MET	Metabolic Equivalent. 1 MET = 3.5 ml O_2/kg/min
MoCA	Montreal Cognitive Assessment
MPQ	Montreal Pain Questionnaire
MVIC	Maximal voluntary isometric contraction
NHP	Nottingham Health Profile
NIH	National Institutes of Health
NSAID	Non-steroidal antiinflammatory
OA	Osteoarthirits
PA	Physical Activity
PF	Physical Function
PRI-S	Pain Rating Index - Sum of mean scale values
QFF	Quadriceps femoris force

QFP	Quadriceps femoris power
QFW	Quadriceps femoris work
QDSA	Questionnaire de Douleur Saint-Antoine
RA	Rheumatoid arthritis
ROM	Range of Motion
SCT	Stair Climbing Test
SF-12	Short-Form 12 Health Survey
SF-36	Short Form-36 Health Survey
SPQ	Social Participation Questionnaire
THA	Total hip arthroplasty
TKA	Total Knee Arthroplasty
TKFQ	Total Knee Function Questionnaire
TUG	Timed Up and Go test
UG	Up and Go test
VAS	Visual analog scale
WHO	World Health Organization
Wimu-GPS	Wireless inertial measurement unit with GPS
WOMAC	Western Ontario and McMaster Universities Arthritis Index

1 INTRODUCTION

Population aging is an event without precedent (Powell, 2010). In one year (2003-2004), the global population of those aged over 65 years increased by 10.3 million (Powell, 2010). From 1981 to 2005, the Canadian population aged over 65 grew from 2.4 million to 4.2 million and their proportion in the Canadian population increased from 9.6 percent to 13.1 percent (Turcotte & Schellenberg, 2007). It is estimated that from 2009 to 2036, this same age group will double and reach 9.9 million (Statistics Canada, 2010). It is estimated that by 2041 there will be 4.5 million Canadians between the ages of 65 and 74 and 3.9 million Canadians aged between 75 and 84. By 2056, there will be 2.5 million Canadians aged 85 and over (Turcotte & Schellenberg, 2007). In Quebec, the population of people aged 65 and over should already surpass that of those aged under 15 in 2011 (Institut de la statistique du Québec, 2009a). Indeed, the amount of people aged 65 years and over in Quebec will increase to around 2.6 million by 2056, indicating a 1.6 million increase since 2006 (Institut de la statistique du Québec, 2009b).

Aging is a biological and heterogeneous process, which begins at birth and ends in death. Individuals age in their own way, at their own speed, according to multiple factors. Most physiological systems, such as the cardiovascular, cardiopulmonary, sensory, neural, mental and musculoskeletal become more vulnerable with age. Declines in these systems' abilities can, eventually, have important ramifications on social, psychological and physical functions, which can lead to disabilities (Bonder & Bello-Haas, 2009).

The term disability is a complex phenomenon used to refer to impairments, activity limitations and participation restrictions. Each of these terms are defined as follows by the World Health Organization (World Health Organization, 2011):

"An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. "

In 2006, the national disability rate in Canada was 14.3 percent (Statistics Canada, 2007). At that time, 1 757 590 Canadians aged 65 and over had a disability (Statistics Canada, 2007).

Musculoskeletal disorders are the most common cause of physical disability and chronic pain (Woolf & Pfleger, 2003) and are among the most common health problems in the elderly (Brock, Guralnik, & Brody, 1990; Jette, Branch, & Berlin, 1990; Praemer, Furner, & Rice, 1992). They can result in the inability to walk, sit, or even difficulty breathing (Langlois, et al., 2006). The pain and disability for which musculoskeletal disorders are responsible, affect social functioning and mental health thereby diminishing the patient's quality of life (Woolf & Pfleger, 2003). The statistics of the burden brought on by musculoskeletal disorders, such as arthritis, back pain and fibromyalgia, for example, have shown to be significant in terms of absolute disability-adjusted-life years (DALYs) and are increasing in both the developed and developing world (Brooks, 2006). The aging population and the obesity epidemic are both significant factors in the increase in prevalence of musculoskeletal disorders (Brooks, 2006). It is estimated that 1 - 2.5 percent of the gross national product of countries worldwide is devoted to musculoskeletal disorders, of which arthritis is the most common (Badley & Wang, 1998).

Arthritis includes inflammation of the joints and encompasses more than 100 rheumatic diseases and conditions (Public Health Agency of Canada, 2010). The various forms of arthritis attack the joints and alter their structures and operations, usually leading to disability and pain, which can make it very difficult to complete many tasks and ADLs (Theis, Helmick, & Hootman, 2007; Health Canada, 2003). Arthritis is a very common musculoskeletal disorder. In fact, it is one of the most prevalent chronic conditions in Canada. In 2007-2008, over 4.2 million Canadians and 744 000 Quebecers had arthritis (Public Health Agency of Canada, 2010). This prevalence increases with age and given the aging population, this trend will have a non-negligible effect on the future impact of the disease on the country. It is estimated that the prevalence of arthritis will increase by 20 percent by 2031 to 6.7 million Canadians (Public Health Agency of Canada, 2010). Arthritis has an important economic impact, which is representative of its consequences on the quality of life of patients. In North America, arthritis has been estimated to cost approximately $100 billion annually (Leigh, Seavey, & Leistikow, 2001); (Jackson, Simon, & Aberman, 2001). This includes the direct expenses associated with medical treatment but the majority of the economic impact is due to indirect costs such as lost wages, disability benefits, and reduced labor productivity (Hunt, Birmingham, Skarakis-Doyle, & Vandervoort, 2008).

Osteoarthritis (OA) is the most prevalent form of arthritis, with rheumatoid arthritis (RA) following close behind (Public Health Agency of Canada, 2010). Unfortunately, at this point, there is no way of reversing the effects of OA. Therefore, patients must go thorough a series of treatments and eventually require total knee arthroplasty (TKA).

TKA surgery is becoming more popular in younger and older elderly individuals and has a reputation as a successful surgery in reducing pain and improving the quality of life of patients. Nonetheless, there is an important number of individuals who do not feel the positive effects of the surgery or remain unsatisfied in terms of its impact on their function, activity and mobility.

Seeing as few studies have incorporated ecological measures to self-reported and performance-based measures, we aim to describe the differences between three groups (pre-TKA, 6-18 months post-TKA and healthy active adults) in terms of functional performance and activity and mobility profiles, on a battery of outcome measures (self-report measures, performance-based measures and ecological measures). As a pilot study, we will also assess the feasibility of the protocol and the variability encountered in the data. Finally, we will explore the relationship between the three types of measures used in this research project.

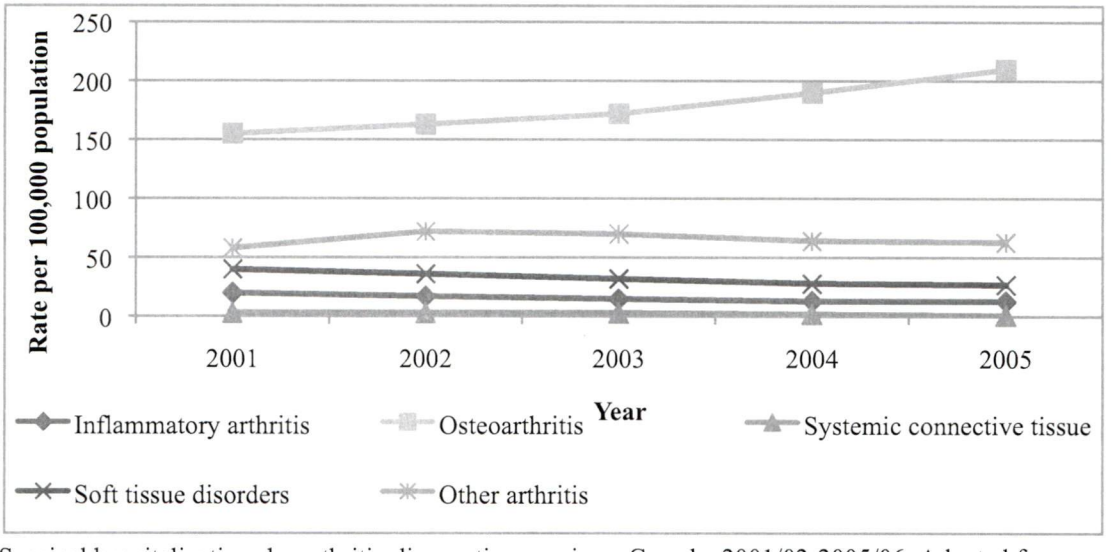
This document will follow a typical order of research protocole, that is, we will first explain the context of the topic, followed by a literature review and problematic of the topic. We then introduce our research objectives and questions, which are followed by our methodology, where we describe the recruitment process, participant selection criteria, data collection and analysis. We then jump into the results of the research project and discuss what was found. Finally, we will conclude this study and report recommendations and future research avenues.

2 CONTEXT

2.1.1 Osteoarthritis (OA)

OA is the most common type of arthritis (Public Health Agency of Canada, 2010) and is a major cause of morbidity, disability and health care use (Badley, 1995; Badley & Wang, 1998). For instance, OA accounts for most of the hospitalizations related to arthritis, particularly surgical hospitalizations related to joint replacements (Public Health Agency of Canada, 2010) (see Figure 1).

Figure 1. Surgical Hospitalizations



Surgical hospitalizations by arthritis-diagnostic groupings, Canada, 2001/02-2005/06. Adapted from Public Health Agency of Canada, 2010

OA is estimated to be present symptomatically in 9.6 percent of men and 18.0 percent of women over 60 years old in developed countries (World Health Organization, 2010). Without any regular diagnostic criteria (Pham, 2010), it is very difficult to determine the precise incidence of OA (Woolf & Pfleger, 2003). OA was estimated in the Global Burden of Disease 2000 study (Lopez & Murray, 1998) to be the fourth leading cause of total years lost due to disease at the global level (Hunter, 2011). In 2000, 25 million North Americans had osteoarthritis (Health Canada, 2003). In Canada,

OA is estimated to affect 10 percent of the population (Langlois *et al.*, 2006).

The etiology of this degenerative disease is not very well known and although it is associated with aging it is not a direct product of it (Langlois *et al et al.*, 2006). According to these same authors: "[...] it is a product of exaggerated or accelerated aging". That is to say, OA is characterized by an abnormality between the processes of bone degeneration and renewal (Das & Farooqi, 2008). Accordingly, there is more degeneration, causing a loss of articular cartilage which is associated with hypertrophy of bone (osteophytes and sclerosis of subchondral bone) and thickening of the capsule (Woolf & Pfleger, 2003) which is demonstrated on the radiograph as narrowing of the space between the joints or joint space narrowing (JSN).

Despite the complex etiology, there are two well-known risk factors for OA; trauma and obesity (Langlois, *et al.*, 2006; Blagojevic, Jinks, Jeffery, & Jordan, 2010). Other risk factors include mechanical stress (such as high impact activities), endocrine and metabolic diseases, high bone mineral-density and heredity (Langlois, et al., 2006). According to Coggon, *et al.* (2001) and Felson & Zhang (1998) obesity is the most important modifiable risk factor of OA. Due to the increasing prevalence of obesity in the past decades (Ogden, *et al.*, 2006) it is very likely that more individuals will be affected by OA, particularly of the knee, due to its weight bearing properties (Hunter & Lo, 2008). Although the knee is most often affected, all synovial joints are susceptible to OA. The more commonly affected joints are the knee, hip, joints of the hand, foot and spinal cord (Woolf & Pfleger, 2003).

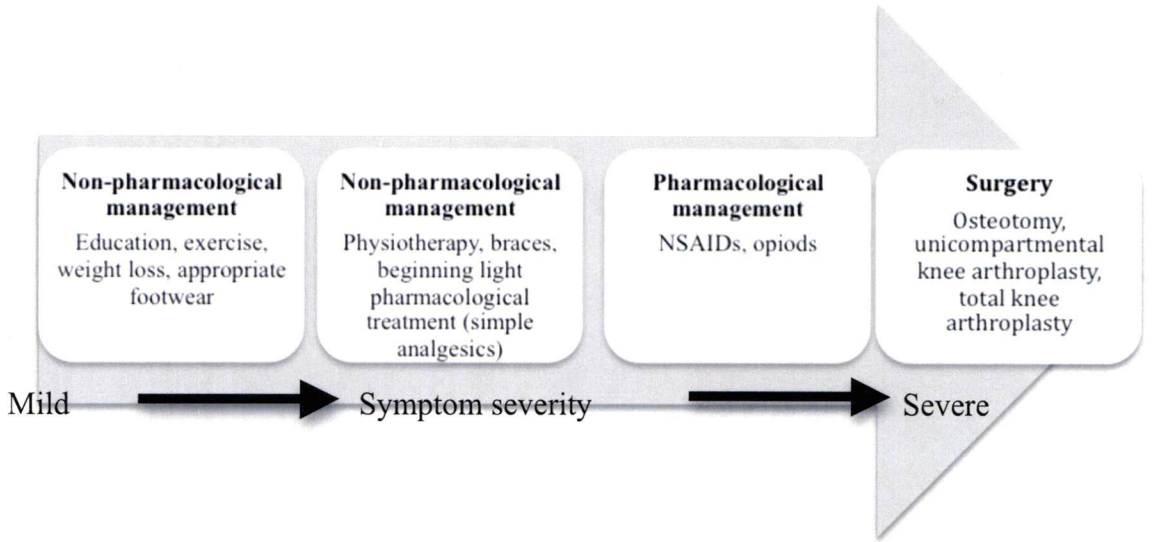
Symptoms and Disabilities Associated with OA

Symptoms and disabilities associated with OA include pain, tenderness and swelling over the joint line, crepitus with movement of the joint, misalignment or deformity, loss of strength, a limitation of range of motion, and abnormal gait (Hunter & Lo, 2008). OA can lead to difficulty with certain movements. For instance, in the case of knee OA, putting on socks or pants, or any activity involving kneeling, squatting or going up and down stairs can be impossible (Langlois, *et al.*, 2006).

OA Treatments

There are currently no known therapies to halt or reverse the progression of OA, and thus, treatment of the disease is largely centered on the management of its symptoms (Hunter, 2010) (see Figure 2). Interventions include educating patients about the disease and available treatments, managing pain, improving function and reducing disability. Patients with moderate to severe osteoarthritis who do not respond to treatments may choose to undergo an elective surgery. Considering the dominant prevalence of OA of the knee and its classification as being the most prevalent cause of mobility dependency and disability (Guccione, Felson, Anderson, & *al.*, 1994), the following section will deal with the available treatments of the latter in particular, although most of the treatments extend to OA in general.

Figure 2. Management of Patients with Osteoarthritis



Stepwise algorithm for the management of patients with osteoarthritis. Emphasizing the need to consider non-pharmalogical treatments first and modifying treatments according to patient's response and preferences. Adapted from Hunter, 2006

Weight Management

As mentioned, a major risk factor of OA of the knee is obesity. Appropriately, most patients with OA are either overweight or obese (Hunter, 2010). Most OA guidelines advocate weight management as an effective intervention in treating OA symptoms (Messier, *et al.*, 2004; Hunter & Felson, 2006; Messier, Gutekunst, Davis, & *al.*, 2005) found that for every kilogram of weight lost, there is a fourfold reduction in load on the knee during daily activities.

Exercise

Exercise can help achieve weight loss. Also, exercises that strengthen the quadriceps can lead to reductions in pain and improved function (Hunter & Felson, 2006). OA patients who can engage in exercise should take part in low impact aerobic

exercise such as walking, cycling or swimming (Hunter & Felson, 2006; Zhang *et al.*, 2008).

Physical Therapy

Patients may also benefit from referral to a physical therapist for an evaluation. Appropriate exercises to reduce pain and improve functional capacity can be recommended, for instance, range of motion exercises, muscle strengthening, muscle stretching, and soft tissue mobilization (Hunter & Felson, 2006). Recently, power training of the quadriceps femoris muscles has been receiving much attention as a training modality with patients with knee OA (Pelletier, Gingras-Hill & Boissy, 2012). There exist other therapeutic options as well such as patella taping, braces, orthotics and assistive devices such as canes and walkers (Hunter & Felson, 2006; Hunter, 2011; Zhang *et al.*, 2008)

Pharmacological Approaches

When previously mentioned interventions have been exhausted and patients are still left with pain, analgesics should be used. Acetominophen can be effective in treating mild to moderate pain in patients with OA (Zhang *et al.*, 2008). In patients who respond inadequately to acetaminophen, NSAIDs are an alternative. However, NSAIDs should be used with caution, as they are associated with potential toxicity, particularly in the elderly (Hunter & Felson, 2006; Zhang *et al.*, 2008). In the case of patients in whom NSAIDs are contraindicated, intolerable or ineffective, opioid analgesics are a useful alternative (Hunter & Felson, 2006).

Surgery

Once pain progresses to an extent that medication can no longer alleviate it and there is major limitation of functions such as walking and daily activities, patients should consider elective surgeries. Such surgeries include, but are not limited to: arthroscopy, osteotomy, unicompartmental knee arthroplasty, and finally, total knee arthroplasty.

In patients with post-traumatic OA, arthroscopy has multiple uses such as debridement of chondral surfaces, lavage of joints, removal of loose bodies, repair or removal of ligaments, fracture fixation and stimulation of chondral regrowth (Choong & Dowsey, 2011). However, in patients with primary OA, the role of arthroscopy has been controversial. Although early improvements occur (in up to 75 percent of cases) it is not long lasting and TKA is often needed within the first year (in 15 percent of cases) (Dervin, Stiell, Rody, & Grabowski, 2003).

Osteotomy is a procedure where the proximal tibia is realigned to redirect the weight-bearing forces through cartilage, which has not been affected by OA (Choong & Dowsey, 2011). Although it can provide pain relief, OA's progression will limit the longevity of this procedure. With a failure rate of 25 percent at 10 years, within six years, patients undergo TKA.

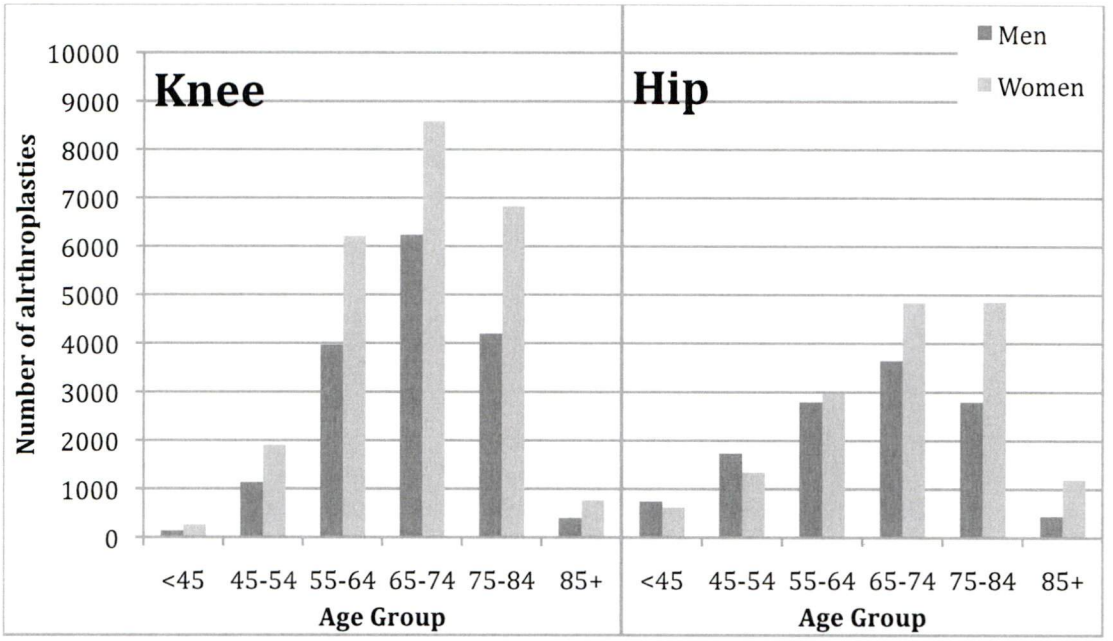
Unicompartmental knee replacement is a procedure used to address OA, which is limited to only one compartment of the knee and the cruciate and collateral ligaments are intact. The surgery is not commonly performed and implant survival is less than that for TKA (Choong & Dowsey, 2011).

Total knee arthroplasty, also known as total knee replacement, is an elective surgery that is advocated when there is evidence of advanced disease resulting in failure

of the joint to operate at a functional level (Vaccaro, 2005). According to the National Institute of Health (National Institut of Health, 2003), OA is the most common disease causing knee joint failure, resulting in the need for TKA. Other common diseases include rheumatoid arthritis (RA), juvenile RA, osteonecrosis, other types of inflammatory arthritis and traumatic injury.

The demand for total knee arthroplasty is very high, more so than total hip arthroplasty (THA) (see Figure 3). While reviewing the international variance in primary and revision TKA in 18 countries with a total population of 755 million, and an estimated 1,324,000 annual primary and revision total knee procedures, Kurtz *et al.* (2011) found Canada to have 143.7 primary total knee procedures/100,000 population (according to the Hospital Morbidity Database, in 2008). According to the same study, the compound annual growth in the number of TKA procedures was 10.3 percent in Canada between 2002-2008. This significant growth in numbers of TKAs is expected to continue exponentially in the next decade principally due to the aging of the baby boomer generation and the obesity epidemic (Fehring *et al.*, 2010). These increases could add further pressure on the health care system, as young people are likely to undergo further surgery (i.e. revisions: an intervention to replace a component of the prosthesis) with most prostheses surviving between 10 to 15 years (Wright *et al.*, 2004).

Figure 3. Number of Knee and Hip Arthroplasties



Number of knee and hip arthroplasties by age and sex, Canada, 2005-2006. Adapted from Canadian Institute for Health Information, 2009

So who exactly should have a TKA? According to the National Institutes of Health (National Institut of Health, 2003), TKA candidates should have radiographic evidence of joint damage, significant functional limitation and moderate to severe pain persisting after ineffective non-surgical treatments have been exhausted.

About 90 percent of patients' pain, functional status and overall health related quality of life is substantially improved rapidly after TKA (National Institut of Health, 2003). However, the factors associated with a lack of improvement and complications are not well known. The common reasons for revision of TKA are aseptic loosening, poly wear, instability, and osteolysis (Talmo, Robbins, & Bono, 2010). Although complication rates following TKA are low, careful perioperative care such as appropriate prevention strategies for infection, thrombolembolic disease and even delirium are important in reducing risk of morbidity, especially in the elderly (Talmo *et al.*, 2010). Many investigations have been aimed at examining implant fixation,

prosthesis design, and bearing surfaces. Be that as it may, there is currently little consensus in the literature on the optimal prosthesis designs and components (Talmo *et al.*, 2010).

Despite recognizing TKA as a cost-effective intervention for individuals with advanced knee OA, patients and surgeons are faced with a few predicaments. According to Dieppe *et al.* (2011), there are four major issues:

1. There aren't any clear guidelines for the utilization of TKA.
2. TKA rates vary widely both nationally and internationally and there exist inequalities in the provision of the intervention.
3. Without a complete understanding of OA, it is difficult to establish when exactly in the development of the disease is the right time to intervene with a TKA and at what age.
4. Not all patients have positive outcomes following TKA. There is an important minority of patients who do not improve or even get worse following the surgery. There are no clear indications in how to identify them prior to surgery.

Summary

In summary, with the aging population there will be more cases of OA and after the short list of treatments have been exhausted, patients will most likely elect for TKA. Therefore, more TKAs will be needed, which are now not only available to an older population but a younger one as well. What remains unclear and yet to be accurately substantiated is whether TKA leads to the effective benefits patients expect it to such as a decrease in pain, an improvement in function and a return to activities performed before painful OA. The following literature review will cover what has been published

on the topic of satisfaction and effectiveness, along with pain, function and mobility and activities following TKA.

3 LITERATURE REVIEW

3.1 TKA Satisfaction and Effectiveness

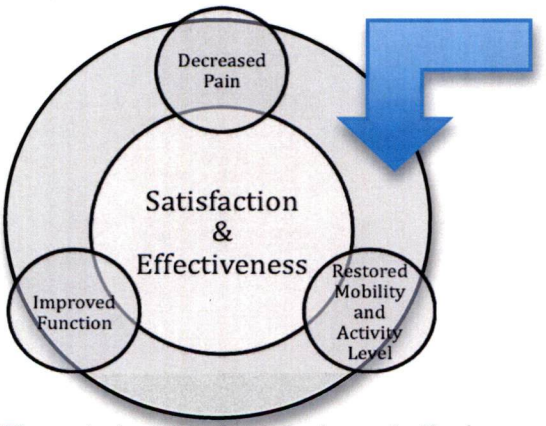
Patient satisfaction varies greatly following TKA, with a significant percentage (between 9 and 19 percent) of patients who are dissatisfied (Noble, Conditt, Cook, & Mathis, 2006; Robertsson, Dunbar, Pehrsson, Knutson, & Lidgren, 2000). According to the disconfirmation model, satisfaction is a function of the magnitude and direction of the difference between a perceived service and an expected service (Thompson & Yarnold, 1995). Therefore, if a service, such as TKA, is performed as expected, this results in confirmation. If there is a gap between expected and perceived performance, disconfirmation results. Expectations can be categorized into four types: 1) ideal, a desired or preferred outcome; 2) predicted, a realistic or anticipated outcome; 3) normative, what should or ought to happen; and 4) unformed, when one is unable or unwilling to articulate expectations (Thompson & Sunol, 1995).

The effectiveness and satisfaction of TKA goes over and above the technical aspects of the surgical procedure. Other elements, such as preoperative assessment, patient education, in-hospital care and rehabilitation also have an impact on treatment effectiveness and patient satisfaction (Parsons & Sonnabend, 2004). Be that as it may, there is currently no standard process or assessment of TKA (Wylde, Dieppe, Hewlett, & Learmonth, 2007). It has been well documented that there is discrepancy in patient and surgeon expectations, characterization of a successful surgery (Bullens, van Loon, de Waal Malefijt, Laan, & Veth, 2001) and evaluation of pain and quality of life

(Mäntyselkä, Kumpusalo, Ahonen, & Takala, 2001; Janse, *et al.*, 2004). Surgeons tend to focus on range of motion, alignment, stability and the need for revision whereas patients focus more on the persisting pain and the functionality of the knee as a whole (Amadio, 1993; Parsons & Sonnabend, 2004). Therefore, the success of TKA could be influenced by the patient's expectations, mobility and physical condition (Anderson, Wixson, Tsai, Stulberg, & Chang, 1996).

Three variables are crucial to assessing TKA satisfaction and effectiveness. These are: 1) pain; 2) function; and 3) restored mobility and participation in activities after TKA (Wylde *et al.*, 2007) (see Figure 4). There are several risk factors that can lead to patient dissatisfaction and ineffectiveness of the TKA such as: socio-demographic, biological, psychological and medical (Wylde *et al.*, 2007). The following literature review will focus on the effectiveness of TKA in reducing pain, improving function and restoring mobility and activity participation in patients with knee OA.

Figure 4. Theoretical Model of Satisfaction and Effectiveness



Modifying Factors:

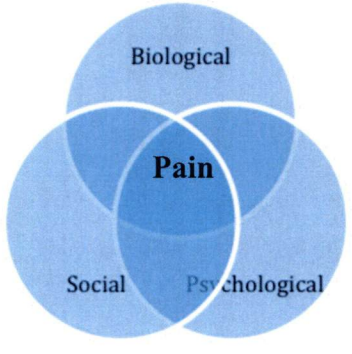
- Sociodemographic
  - *e.g.* sex, age
- Biological
  - *e.g.* health status
- Psychological
  - *e.g.* depression, expectations
- Medical:
  - *e.g.* co-morbidities

Theoretical model of satisfaction and effectiveness and modifying factors of these variables. Adapted from Wylde *et al* 2007.

3.2 TKA AND PAIN

Pain is the primary reason for individuals to undergo TKA (Hawker *et al.*, 1998) and therefore, the evaluation of pain is of major importance in assessing the effectiveness of TKA (Mont, Serna, Krackow, & Hungerford, 1996). As defined by the International Association for the Study of Pain, "[pain] is unquestionably a sensation in a part or parts of the body but it is also always unpleasant and therefore also an emotional experience" (Merskey, 1986 p1). The biospychosocial approach is now widely accepted as a comprehensive conceptual model of the biopsychosocial interactive processes involved in understanding and treating chronic pain disorders (Gatchel, 2004). That is, this model illustrates the interaction between psychological and social factors and the physical pathology, which influences patients report of symptoms and subsequent disability (Gatchel, Peng, Peters, Fuchs, & Turk, 2007) (see Figure 5).

Figure 5. Biopsychosocial Model of Pain



Biopsychosocial model of pain. Adapted from Gatchel et al., 2007.

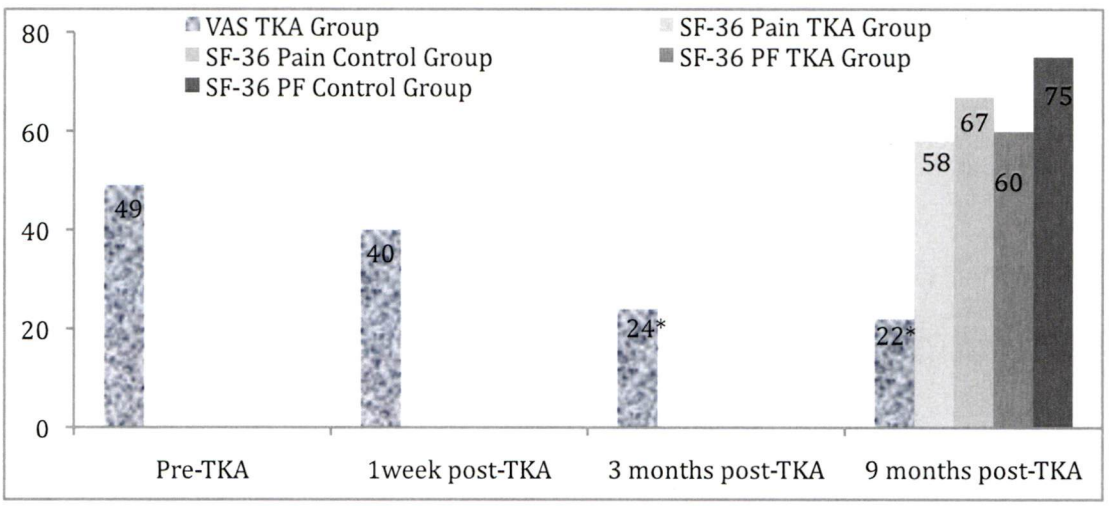
Much of the research literature on the subject of pain following TKA indicates good pain relief following the surgery (V. Wylde *et al.*, 2007). However, there is a significant proportion of patients who experience continuing pain after TKA (Hawker,

2006). These reported estimates vary but are in the region of 7 to 20 percent of TKA patients (Baker, van der Meulen, Lewsey, & Gregg, 2007; Brander *et al.*, 2003; Puolakka *et al.*, 2010; Vikki Wylde, Hewlett, Learmonth, & Dieppe, 2009). This number may seem of minor importance but if the prevalence of TKAs is taken into consideration, this small percentage translates into a considerable number of individuals. In addition, with the predicted increases in the need for TKA, this number is likely to increase dramatically.

Evaluating pain outcomes after TKA is very subjective and can be measured in a variety of different ways. Most of the time visual analogue scales (VAS) and questionnaires are used, but interviews can also bring valuable information. With the help of a VAS and Short-Form 36 Health Survey (SF-36), Heiberg, Bruun-Olsen, & Mengshoel (2010) assessed pain level in 63 TKA patients. A VAS is similar to a ruler, upon which the patient marks his pain level, ranging from "no pain" to " maximum pain" which corresponds to a score between 0 and 100 mm, respectively. The scale for the SF-36 goes from 0 - 100, with 0 indicating extreme problems and 100 indicating no problems. The assessments were done preoperatively and one week, three months and nine months postoperatively. According to the VAS, there was a significant and clinically relevant pain reduction of approximately 50 percent within the first three months (49 ± 18 at preoperative to 24 ± 19 at three month postoperative, $p < 0.001$), which persisted at nine months (22 ± 23, $p < 0.001$). At nine months the SF-36 pain and physical function (PF) subscales were added to compare the TKA subjects to the general population of Norway. The SF-36 mean score on the pain subscale was 58 ± 28 in the TKA group (n=57) and 67 ± 27 in the general population group (n=1190) (see Figure 6). This difference was statistically significant (p=0.03) but was not considered clinically

relevant because according to Spilker (1996), a difference of more than 10 on the SF-36 is needed to be considered clinically relevant. Therefore, at nine months post arthroplasty the TKA group and the general population had similar pain levels. The SF-36 mean score on PF subscale was 60 ±24 and 75 ± 24 ($p < 0.001$) for the TKA group and general population, respectively. This seems to demonstrate that TKA patients fail to reach a similar level of PF at nine months post-arthroplasty as the general population as opposed to pain levels, which seem to be more similar between the two populations. Pain according to the VAS decreased significantly (*$p < 0.001$) from preoperative measure to 3 months and 9 months (Figure 6). However, there was no significant change from 3 months postoperative to 9 months postoperative. SF-36 at 9 months was significantly different between TKA group and general population ($p < 0.03$) but is not considered clinically relevant.

Figure 6. Average VAS Score Before and After TKA



Average VAS score at four time periods and the SF-36 at 9 months Adapted from Heiberg, Bruun-Olsen & Mengshoel, 2010.

Patient expectations tend to have an influence on patient satisfaction. In fact, dissatisfaction can be a manifestation of unrealistic expectations, rather than the result of a poor outcome (Wylde *et al.*, 2007). In a longitudinal study with a five-year follow-up, Nilsdotter, Toksvig-Larsen, & Roos (2009) analyzed the relationship between preoperative expectations and postoperative satisfaction and self-reported outcomes with regards to pain after TKA. With the help of the Knee injury and Osteoarthritis Outcome Survey (KOOS), the SF-36 and additional questions, the authors assessed 102 patients preoperatively, and six months, one year, and five years postoperatively. According to the KOOS and SF-36, the best outcome regarding self-reported pain was seen at the 12-month follow up (84 ± 17 and 72 ± 23, respectively, compared to preoperatively, 38 ± 18 and 30 ± 18, respectively). In relation to their expectations, preoperatively, 98 percent of patients expected much less or less pain postoperatively. At the 12-month follow-up, 93 percent experienced much less or less pain ($p = 0.03$) and after five years, 63 percent experienced much less or less pain than preoperatively ($P < 0.001$). Thus, expectations concerning pain appear to be realistic. This study correlates with others who make it quite clear that joint replacement is useful in terms of treatment of pain.

However, one particular study, but not the lone, delivers words of caution regarding pain following TKA. Interestingly, rather than quantitative analyses of a large number of patients, Woolhead, Donovan, & Dieppe (2005) focused on qualitative analyses of 10 patients, six months post TKA. While all patients reported good or excellent outcomes, most reported persistent pain or disabilities. According to the authors, this may be because patients publicly state they have improved to their physicians or researchers despite having private reservations about residual pain and disability. Furthermore, the authors state that patients may indicate that they are

satisfied, despite experiencing significant pain and functional disability because they want to appear grateful to the surgeon and hospital staff for the operation. Therefore, true rates of pain may be much higher than those reported in the literature.

Overall, the evidence so far is in favor of pain reduction following TKA. Given the study listed above and a few others like it, however, we may need to temper our enthusiasm because patients after surgery never obtain the same pain level of age and gender-matched controls (Weng & FitzGerald, 2006).

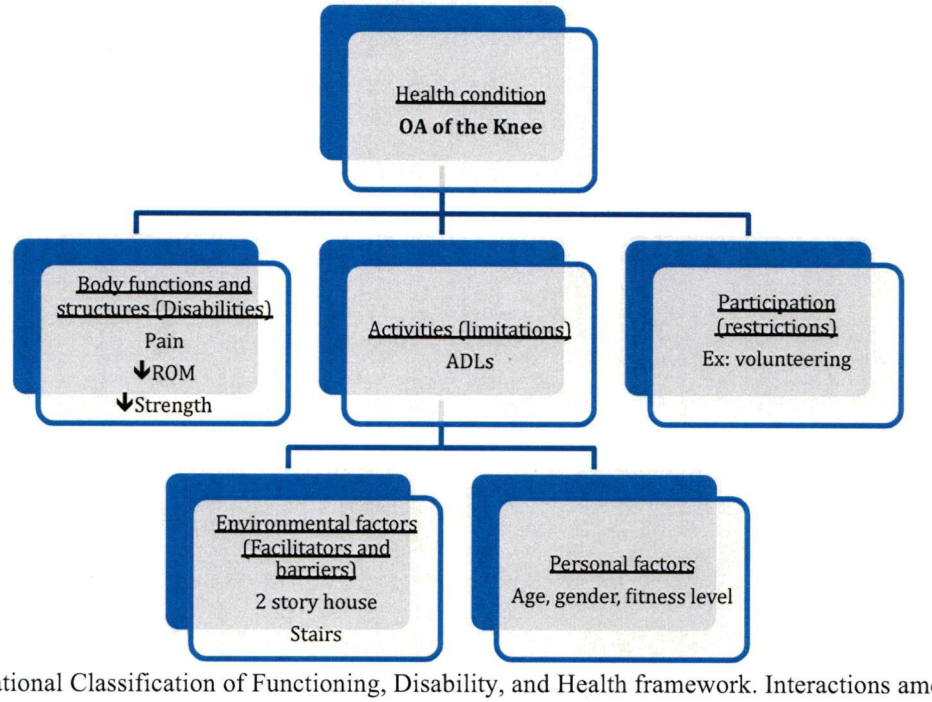
3.3 TKA AND FUNCTION

Improvement in joint function is another popular reason patients elect to go through with TKA. Unfortunately, functional performance in patients still remains lower than that of healthy adults (Bade, Kohrt, & Stevens-Lapsley, 2010; Walsh, Woodhouse, Thomas, & Finch, 1998). Information on functioning and disability is essential in intervention management and evaluation of treatment outcomes (Stucki, 2005). The International Classification of Functioning, Disability, and Health (ICF) allows for functioning and disability to be categorized and described in a systematic and standardized way (Rentsch *et al.*, 2003). We therefore chose to use this model to demonstrate the impact of OA and the resulting impairment of function, on patients' everyday life (see Figure 7).

Both patient-reported questionnaires and performance-based tests are used to evaluate knee function following TKA. Patient-reported evaluations are most often used because they are less time consuming and less expensive than performance-based (Mizner *et al.*, 2010). In addition, they provide useful insight on the patients' perceptions

of their physical functioning following the surgery (Mizner *et al.*, 2010). However, there is some evidence showing that patients are unable to properly report the actual change in functional performance following TKA (Jacobs & Christensen, 2009; Stratford, Kennedy, & Hanna, 2004; Ouellet & Moffet, 2002); Stratford, Kennedy, & Woodhouse, 2006). Scores are heavily influenced by pain (Stratford *et al.*, 2004); Stratford *et al.*, 2006) and level of exertion (Stratford & Kennedy, 2006).

Figure 7. The International Classification of Functioning, Disability, and Health Framework



The International Classification of Functioning, Disability, and Health framework. Interactions among the ICF dimensions for a typical patient with OA. Adapted from World Health Organization. (2003). International Statistical Classification of Disease and Related Health Problems, 10th Revision (ICD-10). Geneva, Switzerland: World Health Organization; and from Bonder & Bello-Haas, 2009

Mizner *et al.* (2010) studied both the patient-reported and performance-based outcome measures to determine the functional changes in 100 patients, post TKA. Self-

reported measures included the Short Form-36 Health Questionnaire (SF-36), the Knee Outcome Survey-Activities of Daily Living Scale (KOS-ADLS) and a global rating score of knee function. Performance-base measures included the Timed Up and Go (TUG) test, Stair Climbing Test (SCT) and Six-Minute Walk Test (6MWT). Physical impairment measures such as pain, knee girth, knee range of motion (ROM) and quadriceps strength were also taken into consideration. After collecting these data at three different time periods (approximately two weeks preoperatively, one month postoperatively and 12 months postoperatively), the authors found that patients' performance-based activity limitations and physical impairments worsened early post-surgery and subsequently improved at 1 year post-surgery. The self-reported measures, however, did not match these changes.

Therefore, there is poor concurrent validity between the self-reported and performance-based measures of activity limitation. A limitation of the study is that the self-reported questionnaire (KOS-ADLS) measures activity limitations experienced during daily activity, whereas the performance-based measures ask the patients to perform at their fastest possible performance, which isn't necessarily the case in daily activities. More importantly, the performance-based measures do not reflect everyday activities or the regular environment of the subject. Additionally, variables capable of influencing the results such as education, BMI and smoking status were not taken into consideration in this study.

3.3.1 Joint Range of Motion (ROM)

As observed in the above studies, outcome research of TKA requires the use of a combination of measures. Maximum knee flexion is widely used as an outcome measure after TKA and is a major component of many scoring systems (Devers *et al.*, 2010). Joint-specific scoring systems such as the Knee Society Score (Insall, Dorr, Scott, & Norman, 1989) combine measures of ROM, stability, alignment, pain, and function as assessed by the clinician (Miner, Lingard, Wright, Sledge, & Katz, 2003). Joint ROM is widely used because it is a simple and direct measure of the joint's condition (Miner *et al.*, 2003). The normal knee, in non-obese, healthy individuals, is capable of flexion up to 160 degrees (Devers *et al.*, 2010). Most activities of daily living such as walking normally on both flat and inclined surfaces, sitting and rising from a chair, and ascending and descending stairs can be performed with a knee that flexes to 110 degrees (Rowe, Myles, Walker, & Nutton, 2000). However, studies designed to assess the relationship between knee flexion after TKA and functional outcomes, quality of life, and patient satisfaction have provided mixed results.

Bade *et al.* (2010) measured changes in active and passive ROM two weeks pre-TKA and six months post-TKA in 24 subjects and compared outcomes with data from 17 healthy adults. Both preoperatively and at six months, active and passive knee ROM was limited when compared to healthy controls. Patients were able to improve their knee extension ROM by six months compared to preoperative ROM (see Table 1 and Table 2). However, knee flexion did not recover to preoperative levels by six months.

Table 1.
Impairments in Patients Before and After TKA Compared to Healthy Adults

Variable*	dults (n=17)	erative (n=24)	A at mo (n=24)	A at mo (n=24)	A at 6 mo (n=24)
lexion	139.7 ± 4.6	120.0 ± 13.6	96.1 ± 13.0	111.5 ± 10.2	113.4 ± 8.9
Flexion	143.4 ± 5.0	123.3 ±12.6	99.6 ± 13.1	114.8 ± 10.7	117.8 ± 8.6§
xtension	-0.9 ± 2.0	3.7 ± 5.6	6.4 ± 5.1	2.3 ± 4.1‡	1.7 ± 5.8‡
Extension	-3.7 ± 2.9	1.3 ± 5.5	3.8 ± 4.9	-0.3 ± 4.0‡	-0.3 ± 6.7‡

Adapted from Bade, Khort *et al.*, 2010
Abbreviations: TKA, total knee arthroplasty.
* All values are reported as mean ± SD
§ n=23
‡ Recovered to preoperative level (p>0.05).

Table 2.
Change in Impairments in Patients Before and After TKA Compared to Healthy Adults

Variable*	From Healthy Adults at Preoperative	erence From Healthy Adults at 6 mo
lexion	-19.7 (-25.8, -13.6)†	-26.3 (-30.7, -22.0)†
Flexion	-20.1 (-25.9, -14.3)†	-25.6 (-29.9, -21.1)†
xtension	-4.6 (-7.2, -2.0)†	-2.6 (-5.3, -0.05)†
Extension	-5.0 (-7.7, -2.3)†	-3.4 (-6.6, -0.3)†

Adapted from Bade, Khort *et al.*, 2010
Abbreviations: CI, confidence interval; TKA, total knee arthroplasty.
* All values are reported as mean ± 95% confidence interval
† Different from healthy adults (P<0.05).

Tables 1 and 2 illustrate that patients awaiting TKA had 19.7° less active knee flexion and 4.6° less active knee extension compared to healthy adults. Although patients were able to improve their active knee extension six months postoperatively, patients still had 2.6° less active knee extension, and 26.3° less active knee flexion than the healthy adults.

Miner et al. (2003) evaluated 684 patients preoperatively and at 12-months post TKA. Knee ROM, Western Ontario and McMaster Universities Arthritis Index (WOMAC), pain and function subscales, patient satisfaction, and perceived improvement in quality of life were measured. They found that there was no significant difference in satisfaction in patients who obtained greater than 95 degrees of flexion after TKA compared to those exhibiting less than 95 degrees flexion at 12-month

follow-up. The WOMAC score 12 months post-TKA, however, was a strong determinant of patient satisfaction and perceived improvement in quality of life (QOL). This demonstrates that even though it is not possible to estimate knee ROM from a subject's WOMAC function score, the latter seems to be the more important indicator of patient satisfaction following TKA.

Devers *et al.* (2010) examined whether high flexion leads to improved benefits in patient satisfaction, perception, and function after TKA. Maximum flexion of 122 knees from 111 patients was recorded post-TKA with a fully sized goniometer. Patients were assessed pre-arthroplasty and minimum one-year post-arthroplasty using the Total Knee Function Questionnaire (TKFQ) and additional questions. The knees were later classified into 3 subgroups according to the value of maximum knee flexion: low flexion (≤110 degrees; n=21), midflexion (111 to 130 degrees; n=81), or high flexion (>130 degrees; n=20). The overall correlation between the degree of postoperative knee flexion and the overall level of patient satisfaction was not statistically significant. However, none of the patients in the high flexion group were dissatisfied with the outcome of their TKA. High knee flexion was significantly associated with achievement of preoperative expectations and elimination of functional limitations.

3.3.2 Quadriceps strength

Changes in quadriceps strength following TKA have not been assessed as well as changes in knee pain and ROM (Mizner, Petterson, & Snyder-Mackler, 2005). Weakness in the quadriceps has been shown to be an important impairment related to functional performance before and after TKA (Mizner *et al.*, 2005; Petterson *et al.*,

2009; Mizner & Snyder-Mackler, 2005).

Mizner *et al.* (2005) investigated the time course of recovery of impairments and function following TKA in 40 subjects. Tests at five different times (two weeks preoperatively, one, two, three and six months postoperatively) included: isometric quadriceps strength assessment, using a burst superimposition technique; pain assessment, using two questions derived from the bodily pain subscore from the SF-36 Health Survey; knee ROM; two functional tests (Timed Up and Go (TUG) and Stair Climbing Test (SCT) and lastly, two self-assessment questionnaires (SF-36 and KOS-ADLS). The results showed that all assessments could demonstrate a main effect change over time ($p < .001$) except for the uninvolved quadriceps strength ($p = .354$). Quadriceps strength was the physical measure that declined the most and was the most highly correlated impairment with functional performance. As the strength of the involved quadriceps improved, there was an accompanying improvement in the relationship between involved quadriceps strength and function (see Table 3). This relationship between involved quadriceps strength and functional outcome is stronger than functional outcome and pain, as well as functional outcome and ROM.

Table 3.
Knee ROM, Quadriceps Strength, Functional Tests and Self-Assessments

Test Period	Variable	Pretesting	1 month	2 months	3 months	6 months
Max Involved Knee Ext (°) *	Mean ± sd	3 ± 4	5 ± 5	3 ± 4	2 ± 3	1 ± 2
	Range	-5 - 15	-3 - 18	-2 - 15	-4 - 10	-4 - 6
Max Involved Knee Flex (°)	Mean ± sd	119 ± 12	94 ± 15	109 ± 12	114 ± 11	116 ± 11
	Range	95 - 142	57 - 122	83 - 130	80 - 132	84 - 135
Involved Quad MVIC	Mean ± sd	18 ± 8	7 ± 4	11 ± 5	15 ± 6	18 ± 8
	Range	3 - 38	3 - 24	4 - 26	6 - 31	7 - 34
Uninvolved Quad MVIC	Mean ± sd	23 ± 10	22 ± 9	23 ± 9	23 ± 10	23 ± 10
	Range	8 - 53	3 - 42	7 - 46	9 - 47	5 - 44
TUG	Mean ± sd	9.6 ± 2.4	12.9 ± 4.1	9.1 ± 2.4	7.9 ± 1.5	7.6 ± 1.6
	Range	5.5 - 15.8	7 - 29.9	5.5 - 20.8	5.3 - 12.5	5 - 11.2
SCT	Mean ± sd	20 ± 9.1	26.2 ± 9.7	16.7 ± 5.8	12.8 ± 3.6	11.9 ± 3.2
	Range	8.2 - 55.7	10.6 - 57.5	8.2 - 30.6	6.9 - 24.7	6.7 - 19.3
KOS-ADLS	Mean ± sd	53% ± 15%	54% ± 14%	69% ± 13%	78% ± 12%	83% ± 8%
	Range	21% - 91%	30% - 80%	40% - 97%	53% - 100%	66% - 100%
SF-36 Bodily Pain	Mean ± sd	43.8 ± 19.5	35.5 ± 18.2	55.4 ± 17.6	65.8 ± 16.2	71.4 18.7
	Range					

Adapted from Mizner *et al*, 2005
Abbreviations: Ext, extension; Flex, flexion; MVIC, maximal voluntary isometric contraction (N per body mass index); TUG, timed up and go test; SCT, stair climbing test; KOS-ADLS, Knee Outcome Survey Activities of Daily Living Scale;.SF-36 Short Form 36 Health Survey.
* Positive numbers indicate positions in flexion and negative numbers indicate positions in hyperextension.

These findings do, however, contain certain limitations. Firstly, the bodily pain measures were not specific to knee pain, and therefore, the pain associated with other conditions may have had an influence. Secondly, as much as the study had multiple follow-ups, it is difficult to interpret the six-month follow up as being the final status of rehabilitation. Results would have been more reliable had there been a one year follow-up as well.

One reason for the discrepancy in the relationship between knee function (knee ROM and quadriceps strength) and self-reported outcomes is that there is no established

category between what constitutes high, medium, or low flexion or strong vs. weak quadriceps (Devers *et al.*, 2010). In addition, there are many differences in the methods used to assess subjective patient outcomes, making it even more difficult to compare outcomes across studies. Some authors use joint-specific scoring systems such as the Knee Society Outcome Score and others go with disease-specific measures such as the WOMAC or KOOS and general health status measures such as the SF-36.

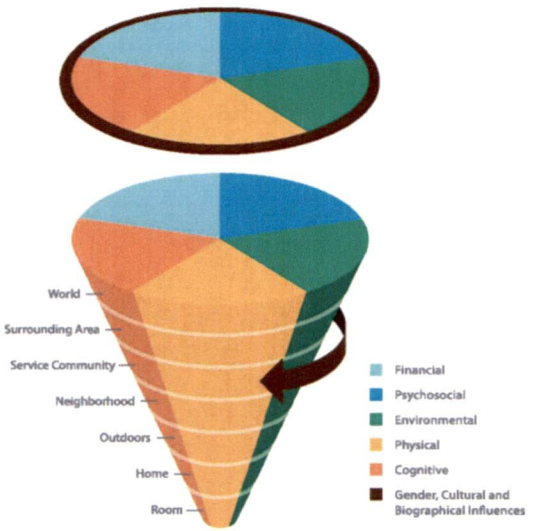
3.4 4.4. TKA, Activities and Mobility

TKA is accepted as an effective and successful end-stage surgical procedure for relieving chronic pain and functional disability (Wylde *et al.*, 2007). However patient expectations regarding physical activity and sports participation after surgery are increasing (Naal, Impellizzeri, & Leunig, 2009; Nilsdotter, *et al.*, 2009). Most patients expect not only to be pain free with a functioning joint following surgery, but to return to a high level of activity (Parsons & Sonnabend, 2004).

Physical activity is an important component to a healthy cardio-respiratory system and is associated with a lower risk of morbidity and mortality (Blair *et al.*, 1995). Although there are numerous aerobic activities in which individuals can engage to achieve national physical activity recommendations, walking is the most commonly performed aerobic activity (Hamer & Chida, 2008). Walking is of course a form of mobility and therefore being free of mobility impairments allows greater mobility. To define mobility in a holistic fashion, we borrow the definition from Webber *et al.* (2010), who states that mobility is: "the ability to move oneself (either independently or by using assistive devices or transportation) within environments that expand from one's

home to the neighborhood and to regions beyond." Webber's theoretical model of mobility includes seven life-space locations where the further away from the individual is from their home, the more mobility determinants (cognitive, psychosocial, physical, environmental, and financial factors) come into play. The model also recognizes the impact that gender, culture, and personal life history have on the experiences, opportunities and influences of mobility (see Figure 8).

Figure 8. Theoretical Framework of Mobility



Theoretical Framework of Mobility. Adapted from Webber *et al.* (2010).

Despite the widespread knowledge of the beneficial effects of physical activity, it is not a regular assessment following TKA (Naal *et al.*, 2009). Due to the lack of attention to this area, there are no clear guidelines as to what is the appropriate level of physical activity needed to attain adequate cardio-respiratory and muscular fitness without compromising implant durability (Naal *et al.*, 2009). Nonetheless, what needs to be clarified beforehand is whether TKA truly allows the patients to return to a level of physical activity experienced before the surgery. As the aging population seeks an active

life after retirement, activity and mobility assessments will become an important aspect of TKA satisfaction.

Currently, the surgery's capability in improving functional ability is variable (Wylde *et al.*, 2007). It is however, expected that there should be a level of impairment following the surgery because even age-matched individuals with no knee pathology admit to some activity limitation (Wylde *et al.*, 2007). However, Hawker *et al.* (1998) found that compared to individuals with healthy knee function, three times more TKA patients reported difficulty with activities because of their knee function. Functional limitations have a big impact on a multitude of activities of daily living such as shopping, dressing, walking and getting out of a bed or chair (Wylde *et al.*, 2007).

The following section will look at the role of TKA in re-establishing a level of activity and mobility in patients suffering from end-stage osteoarthritis. Additionally, we will look at the three types of methods with which mobility and activity levels have been evaluated: 1) self-reported, which measures an individual's capacity by assessing what that individual says they can do (self-report, interview); 2) performance-based, where the individual's capability is measured with timed tests and standardized task completion (clinical tests, such as TUG and SCT); and 3) real-world performance, where what the individual actually does in their home or community is measured, providing measures of frequency and duration of activities (ex: life-space and active time measured by global positioning system [GPS] and accelerometry).

3.5 Typical Instruments used to Evaluate TKA

3.5.1 Self-Reported Measures

Self-report questionnaires are a frequent method of collecting information because they are claimed to be easier to use, less expensive, less time-consuming and less of a hassle for patients (Steultjens, Roorda, Dekker, & Bijlsma, 2001). Self-reported measures are taken when the subject is asked to indicate their perceived level of functioning. The information collected is what the subject thinks they can do (Terwee, Mokkink, Steultjens, & Dekker, 2006). Examples of self-reported measures include self-reported questionnaires, visual analogue scales and interviews. In the sections that follow, these measures will be briefly described in order to demonstrate the usefulness and the shortcomings of the popular methods used in assessing activity and mobility following TKA.

Patient-Reported Visual Analogue Scales (VAS)

As seen earlier, a VAS is often used in assessing the pain level of patients. The patient marks the level of pain felt on a ruler ranging from "no pain" to "maximum pain" which corresponds to a score between 0 and 100 mm. A visual analogue scale is a very useful instrument in measuring the pain level of patients because there are multiple levels the patient can choose and it is difficult to memorize the level previously chosen in the case of a pre-and post-intervention evaluation (Boeckstyns & Backer, 1989).

Patient-Reported Western Ontario and McMaster University Osteoarthritis Index (WOMAC)

The WOMAC (Bellamy, Buchanan, Goldsmith, Campbell, & Stitt, 1988) is a very popular instrument used to evaluate hip and knee OA. It is composed of 24 multiple-choice questions, and divided in three categories: joint stiffness, joint pain and joint function. The answers are based on a 5-point Likert scale (5 = worst, 1 = best).

Patient reported Knee injury and Osteoarthritis Outcome Score (KOOS)

The KOOS (Roos, Roos, Lohmander, Ekdahl, & Beynnon, 1998) method of scoring is an extension of the WOMAC. It was developed for use with younger and/or physically active patients with knee injury and/or osteoarthritis but it is also valid for elderly patients with TKAs (Roos *et al.*, 1998). The KOOS contains 42 self-administered questions that are self-explanatory and cover five patient-relevant dimensions: pain, other disease-specific symptoms, ADL function, sports and recreation function, and knee-related quality of life. The WOMAC pain questions are included in the KOOS subscale "pain", the WOMAC stiffness questions are included in the KOOS subscale "other disease-specific symptoms", and the WOMAC subscale "function" is equivalent to the KOOS subscale "ADL".

Medical Outcomes Study 36 Item Short Form Health Survey (SF-36)

The SF-36 is widely used as a generic measure of outcome (Ware & Sherbourne, 1992). It is self-explanatory and takes about 10 minutes to complete. It is composed of eight domains: physical function, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. All subscales are scored from 0 -

100, with 0 indicating extreme problems and 100 indicating no problems. There is also a validated shorter version of the questionnaire, the SF-12.

Patient-Reported Total Knee Function Questionnaire (TKFQ)

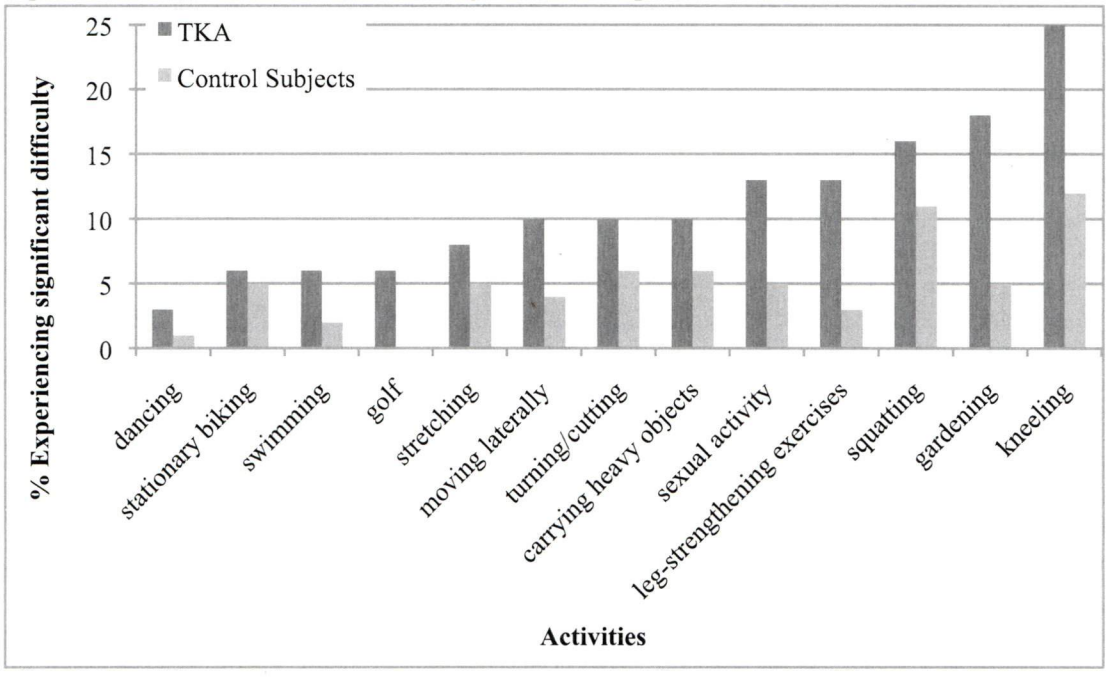
The TFKQ is a validated self-administered survey instrument consisting of 55 multiple-choice questions relating to symptoms and functional abilities involving the knee (Weiss *et al.*, 2002). Consisting of 42 questions that query the personal importance, frequency, and difficulty of performing three types of functional activities: (1) baseline activities defined as fundamental activities of daily living, such as walking, stair climbing, sitting, foot care, bathing, and car travel; (2) advanced activities, which require greater strength, control and ROM, including kneeling, squatting, moving laterally, turning and cutting, and carrying loads; and (3) recreational activities and exercises, including stretching, stationary biking, leg strengthening, swimming, golfing, tennis, cross-country skiing, downhill skiing, dancing, gardening, sexual activity, and running. Thirteen additional questions evaluate patient satisfaction, activity level, pain, stiffness, and swelling. Each answer is assessed on a 5-level scale ranging from very satisfied to very dissatisfied.

With the help of this self-reported questionnaire, Noble *et al.* (2005) collected data on basic, advanced and recreational activities involving the knee from 243 patients one year after TKA and 257 age- and gender-matched controls with no prior knee disorders. After examining the reported frequency, importance and difficulty in the listed activities, the authors found that TKA patients were more likely to report difficulty in doing functional activities than control subjects (52% versus 22%, respectively) (see Figure 9). Function scores were particularly higher for the control subjects in activities

such as kneeling, squatting, moving laterally, turning and cutting, carrying loads, stretching, leg strengthening, tennis, dancing, gardening and sexual activity. Nonetheless, TKA patients and control subjects had similar knee function in activities such as swimming, golfing and stationary biking. Although approximately 40 percent of the functional deficits present after TKA seem to be attributable to the normal physiologic effects of aging, patients who had TKA still seem to experience substantial functional impairments compared to their age- and gender-matched peers.

In the case of more demanding activities, Huch *et al.* (2005) studied the impact of joint replacement surgery on sports activity. With 420 hip replacement patients and 389 knee replacement patients under the age 76 years old (mean age at baseline of 63.6 ± 8.8 and a mean age at five year follow up of 63.0 ± 8.7) the authors found contrary results for sports activity participation at five year follow up for hip and knee replacements patients. After analyzing the self-reported questionnaires, the authors found that only 36 percent of patients with hip OA and 42 percent of patients with knee OA maintained sports activities at the time of surgery. Five years postoperatively, the proportion of patients performing sports activities increased to 52 percent among patients with hip OA, but further declined to 34 percent among patients with knee OA. Although the hip OA group had a higher proportion of men and younger patients (who according to the findings, are more likely to maintain sports activities), a more localized pattern of OA distribution, and a lower pain score than the patients with knee OA (9 versus 16 percent, respectively), a much higher participation in sports activities was seen in the hip OA group than in the knee OA group, even after controlling of potential confounders (including age) in multivariate analysis.

Figure 9. TKA and Control Subjects' Self-Reported Difficult Activities



Comparison of the percentage of TKA and control subjects reporting significant difficulty while doing various activities. Adapted from Noble et al, 2005.

3.5.2 Performance-Based Measures

Contrary to a self-reported measure, a performance-based measure is one in which the subject must perform specific tasks evaluated in a standardized manner, such as counting repetitions or timing activities (Guralnik, Branch, Cummings, & Curb, 1989). They evaluate what a subject can do (rather than what they think they can do) (Terwee *et al.*, 2006). Some consider performance-based measures as being less valid than self-reported because they are done in artificial environments, such as laboratories and clinics (Myers, Holliday, Harvey, & Hutchinson, 1993; Sager, Dunham, Schwantes, Mecum, & et al., 1992). They therefore do not reflect the subject's real environment and can be influenced by the subject's motivation to participate. The positives of performance-based measures are that they are less influenced by many other factors such as expectations and beliefs (Watson & Pennebaker, 1989), culture, language, and

education level (Elam, Graney, Beaver, El Derwi, & et al., 1991; Sager *et al.*, 1992). Additionally, it has been suggested that performance-based measures can help identify early deficits in physical functioning which could not be identified by self-reports (Fried, Herdman, Kuhn, Rubin, & Turano, 1991; Fried, Bandeen-Roche, Chaves, & Johnson, 2000). Following are some of the most commonly used performance-based measures.

Timed Up and Go Test (TUG)

This test requires the subject to rise from a chair, walk three meters, turn and come back to sit down (Podsialdo & Richardson, 1991). The duration of the test is recorded. The TUG is widely used to assess mobility in older adults and has excellent test-retest reliability (ICC = 0.97) (Steffen, Hacker, & Mollinger, 2002). There exist variations to the test, such as the 8 ft. Up and Go, where the participant walks 8 ft. (2.44 m) rather than 3 m.

Six-Minute Walk Test (6MWT)

The 6MWT consists of having the subject walk at free and comfortable speed during six minutes. The distance walked is recorded. Because of its strong responsiveness to change over time in patients with TKA, the 6MWT has been favored as a performance measure (Ouellet & Moffet, 2002); (Kennedy, Stratford, Riddle, Hanna, & Gollish, 2007).

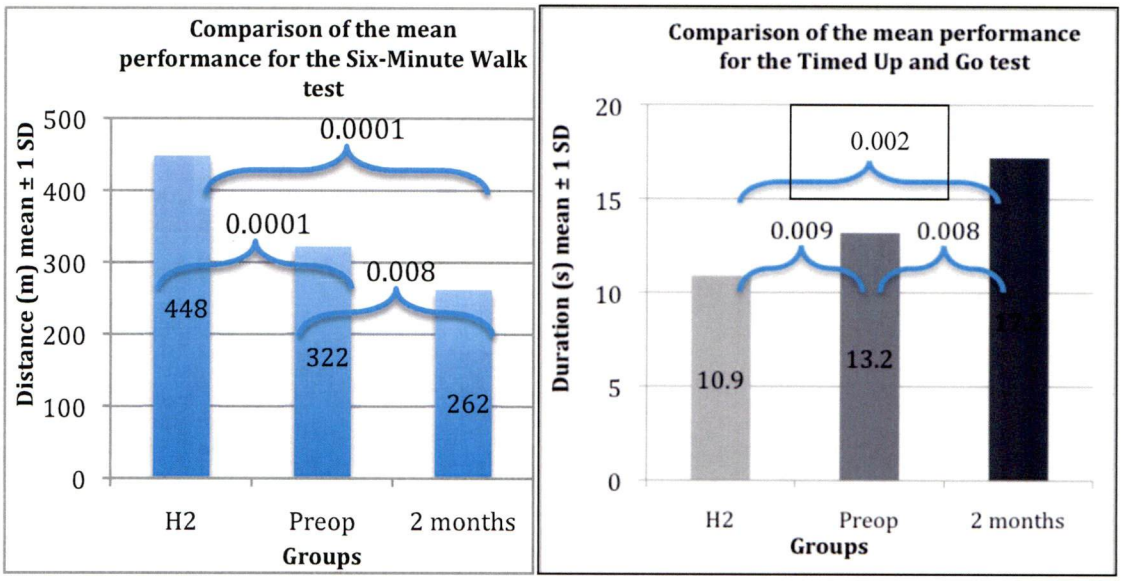
Stair Climbing Test (SCT)

The SCT measures the time it takes a subject to get up from a chair, ascend and descend a flight of stairs and sit back down. The handrail is allowed if required. Rejeski *et al.* (1995) found the SCT to have an excellent test-retest reliability coefficient of 0.93.

In the case of mobility following TKA, Ouellet & Moffet (2002) looked at TKA patients' (n=16) locomotor deficits before and 2 months following TKA and compared pre- and post-operative performances with healthy subjects (n=39). The subjects were evaluated using performance-based measures that included laboratory gait and stair-ascent evaluations, the TUG and the 6MWT, respectively. The study found that there were still large locomotor deficits two months after TKA compared with healthy subjects. The TKA group took on average 21 and 58 percent more time than the healthy subjects for the TUG test before and two months post TKA, respectively. For the 6MWT, TKA group walked 72 and 58 percent of the distance traveled by healthy subjects, before and two months after TKA, respectively (see Figure 10). Additionally, the gait speed was 20 percent less, the stair ascent duration 29 percent longer, the TUG duration 30 percent longer, and the distance walked during the 6MWT was 19 percent less than before surgery. These results demonstrate the worsening of locomotor functioning in the first months following TKA. However, these results do not allow for any analysis beyond two months post TKA.

Figure 10 shows the comparison of the mean performance (± 1 SD) for the Timed Up and Go (left) and the 6MW test of a group of patients with knee OA (n = 16) before and two months after TKA, and a group of healthy subjects (H2, n = 21). Results (*p* values) of the statistical comparisons between groups and over time are indicated over the corresponding horizontal lines.

Figure 10. Timed Up and Go and Six-Minute Walk Tests Comparison



Comparison of the mean performance for the Timed Up and Go and Six-Minute Walk tests. Adapted from Ouellet & Moffet, 2002
Preop = preoperative evaluation; 2 months = evaluation 2 months after TKA.

Stratford, Kennedy, Maly, & MacIntyre (2010) studied the systematic differences in self-report measures (Lower Extremity Functional Scale [LEFS] and WOMAC physical function [PF] subscale) and performance-based measures (6MWT and TUG test) prearthroplasty and 9 to 13 weeks postarthroplasty in 85 patients with either TKA (n = 47) or Total Hip Arthroplasty (THA) (n = 38). For both the 6MWT distance and TUG time, patients reported substantially greater functional status levels for the LEFS and WOMAC-PF postarthroplasty compared to prearthroplasty. According to the authors and their analysis, dependence on self-report measures alone will result in an overestimation of the patients' mobility after TKA. This is in accordance with previous studies (Walker, Heslop, Chandler, & Pinder, 2002; Kivinen, Sulkava, Halonen, & Nissinen, 1998; Terwee, et al., 2006) that have reported self-report and performance-based measures as assessing different aspects of functional status. It is therefore recommended that a battery of performance tests which consists of essential

and diverse activities such as stair climbing, standing, transferring and ambulation be considered.

Although this study provided evidence of the need for performance-based measures to accompany self-reported measures, it contains several limitations. Firstly, the study did not mention the time period between the prearthroplasty evaluation and the surgery. Secondly, this study is limited to patients at 9 to 13 weeks postarthroplasty. It is also important to mention that this interval of 9 to 13 weeks is at a delicate time in the rehabilitation period and therefore does not correspond to recovered patients. Thirdly, the validity of these findings is limited to the 85 patients who contributed and we cannot be certain the 77 patients who did not contribute data would not have had an effect on the results. Finally, the application of two performance-based measures as reference standards for the ability of patients to move around is lacking validity in our opinion. As we will see in the following section, real-world performance evaluations measure the subjects in a legitimate environment, during their everyday activities. Performance-based measures are quite limited in interpretation of mobility and although they bring valuable information, real-world performance evaluations need to be included for one to conclude aspects of mobility and activity levels.

3.5.3 Ecological (Actimetric & GPS-Based Measures)

As mentioned, mobility is often measured using clinical performance tests, such as joint range of motion (ROM), six-minute walk test (6MWT), stair climb test (SCT), sit-to-stand test, etc. These tests are considered valid but the problem is they are too simplistic and therefore do not necessarily reflect the activities of everyday life. Self-

report questionnaires have drawbacks as well. They report subjective information, which can be influenced by many factors such as, pain, fatigue, level of motivation, etc. Therefore, even though some self-reported and performance-based studies have shown an improvement in patients' activities and mobility following the surgery, it is still unclear whether there is an actual, real-life improvement in activities and mobility following TKA. Furthermore, previous studies suggest weak or no correlation between self-report and performance-based tools in patients undergoing TKA (Gandhi, Tsvetkov, Davey, Syed, & Mahomed, 2009). On the other hand, many technological advances, such as gait analysis, calometry, pedometers and accelerometers, have allowed activity levels to be measured objectively. Unfortunately, all of these methods have certain drawbacks as well, like high costs, lack of detailed analysis or impossibility to measure in a real world setting (Mathie *et al.*, 2004). Accelerometers do, however, show promising abilities in reporting useful, objective and real-life quality information.

Active time

Accelerometers are very efficient devices used to measure motion of body segments and are becoming very popular in the clinical setting as well as free-living environments (Mathie *et al.*, 2004). Not only do they demonstrate a high degree of reliability in measurement, and little variation over time (Bouten, Koekkoek, Verduin, Kodde, & Janssen, 1997); (Meijer, Westerterp, Verhoeven, Koper, & ten Hoor, 1991); (Moe-Nilssen, 1998); (Hansson, Asterland, Holmer, & Skerfving, 2001), they have also shown to be an effective instrument in measuring metabolic energy expenditure (EE), physical activity, balance and postural sway, gait and falls (Mathie *et al.*, 2004).

It is possible to estimate EE by measuring physical activity. Accelerometers provide a valid method of estimating EE in a free-living environment (Yang & Hsu, 2010). Although kilo-calories/minute and kilo-Joules/minute are the most commonly used measurements of EE, metabolic equivalents (METs) can be used as the unit of regression in EE estimation. A MET is defined as 3.5 ml O_2/kg/min and is often used to quantify the extent of activity intensity (Twomey, Faul, & Marnane, 2010).

Mathie *et al.*, (2004) carried out a pilot study to evaluate the feasibility of using a triaxial accelerometer to monitor human movements in an unsupervised home environment, in hopes of detecting changes in functional status. The study followed six healthy individuals aged between 80 and 86 years old, who wore the triaxial accelerometer for an average of 11.2 hours per day for two to three months. Results showed that subjects reported a lower health status for weeks in which they expended less energy. Additionally, units were worn on 88% of the days in the study, demonstrating high compliance rates. Ultimately, the use of a triaxial accelerometer was found to be practical for long-term monitoring in an unsupervised home environment.

Regarding studies focusing on measuring physical activities in patients after or undergoing TKA, Naal & Impellizzeri (2010) systematically reviewed the literature on the bibliographic databases, Medline, Cochrane Library, and EMBASE published until 2008, that did so with the use of accelerometers and pedometers. Although accelerometers have been widely used to assess mobility and active time, the systematic review found only one study that used an accelerometer to quantify the increase in ambulation following by TKA for osteoarthritis of the knee.

Walker *et al.* (2002) compared 19 subjects using the measured Numact (Newcastle Universities Medical Activity) ambulatory activity monitor and self-reported

Nottingham Health Profile (NHP) questionnaire within one month of surgery, at three months post-surgery and again at six months post-surgery. The Numact monitor consists of a microprocessor and data logger contained in a single unit. It allows accurate recording of the activity of an individual in terms of posture (supine, sitting, standing) and activity while standing (number and intensity of steps taken) (Walker, Heslop, Plummer, Essex, & Chandler, 1997). The results of the study demonstrated an increase in activity at six months post-surgery according to the activity monitor, and an improvement in the pain and mobility scale of the NHP at three months post-surgery. Interestingly, between three and six months post-surgery, as the measured activity was increasing, self-reported mobility declined. This is not very common; as patients tend to overestimate their performances, rather than under estimate them (Hagstromer, Oja, & Sjostrom, 2007). Nonetheless, the results of the study show that at six months the overall increase in ambulatory activity amounted to 79%. It would seem, according to this study, that TKA for OA is an effective way of improving ambulation. This study is, however, quite limited. The number of subjects was not large enough to study the totality of effects of TKA. Although it contained multiple data collection times, it would have been more comprehensive if a one-year post-surgery data collection time had been included. More importantly, 24 hours of activity monitoring is not judged to be enough to allow a recording of unbiased real-life activity. Nonetheless, this study acted as a pilot study aimed at gaining an idea of subjects' actual activity before and after TKA.

In order to add precision and additional information, a GPS can be set up with the accelerometer, making it possible to determine where and at what speed, physical activity actually occurs (Rodriguez, Brown, & Troped, 2005) thereby bringing about valuable information on an individual's life-space.

Life-space

According to Stalvey, Owsley, Sloane, & Ball (1999), life-space is an estimate of the extent of travel into the environment, no matter the mode of transportation used. GPSs have had numerous applications since their development circa 1995 such as, navigation systems to direct emergency response activities (Rainham, Krewski, McDowell, Sawada, & Liekens, 2008) and identification of high-risk areas for transmission of vector-borne and environmental diseases (in conjunction with other technologies) (Keating, Macintyre, Mbogo, Githure, & Beier, 2004). They are also beginning to show promising opportunities in human tracking which could greatly improve the understanding of how certain environments influence human activity and health (Rainham *et al.*, 2008). A GPS offers researchers the opportunity to collect high-resolution time (s) and space (m) data for long periods of time (Shoval *et al.*, 2010) on people's mobility zones (Webber, Porter, & Menec, 2010). These are: the room where one sleeps, the home (e.g., house, apartment, institution), the outdoor area surrounding the home (e.g., yard, parking lot), the neighborhood (e.g., nearby streets or parks), the service community (e.g., shops, banks, health care facilities), the surrounding area (e.g., within one's country), and the world (see figure 13). In the following section, we will look at the usefulness of a GPS to geographically contextualize accelerometer data, which would indicate where physical activity occurs.

Rodriguez *et al.* (2005) examined the usefulness of complementing accelerometer-based physical activity measurements with GPS data to determine where physical activity occurs. First, they examined the GPS unit's validity and inter-unit reliability by measuring the distance to a geodetic point. They also evaluated inter-unit reliability by comparing GPS data collected in three built environments (open space with

some tree canopy, clustered development - high density development with open space surrounding it, and urban). Additionally, the authors conducted a pilot study with 35 subjects, aimed at determining the usefulness of GPS units with accelerometers to measure where physical activity occurs. Results showed that individuals obtaining most of their moderate-vigorous physical activity in their neighborhoods tend to live in areas with higher population density, housing unit density, street connectivity, and more public parks. They concluded that GPS data are sufficiently precise to track participants' movements and therefore, when combined with accelerometry-based physical activity measures, can bring valuable information to the relationship between environment and physical activity.

Rodriguez *et al.* (2011) confirmed the previous results with a larger subject-based study (293 females aged 15 to 18 years old). Participants wore an accelerometer and GPS for all waking hours (average of 13.2 h/day ± 1.1 h) of the day for 6 consecutive days. Again, a higher physical activity intensity was more often identified in places with parks, schools, and a high population density, during weekdays, and lower in places with more roads and food outlets. This study demonstrated the usefulness of the accelerometer-GPS combined technology to help clarify the relationship between where physical activity and sedentary behaviors occur. Certain limitations apply to this study. Firstly, only 265 of the 293 subjects were observed in the two measurement periods and some of which only had an hour of recording. Secondly, data loss occurred due to certain programming choices made, such as only considering points with GPS locations and omitting points within 60 m from home and school. Additionally, the types of activity that occurred indoors (*i.e.* at the gym) were not taken into consideration.

Troped *et al.* (2008) also demonstrated the effectiveness of combining GPS and

accelerometer data. Ten adults wore this combination during bouts of activities such as, walking, running, bicycling, inline skating or driving an automobile. Through the use of discriminant function analysis, this study discriminated between physical activities and demonstrated that the addition of GPS to accelerometer monitoring improves physical activity mode classification. Based on two variables derived from the raw accelerometer data (median activity counts and median steps during a bout) and an additional variable from the GPS (median GPS speed) researchers were able to correctly classify 93% of bouts of activity. Larger studies are needed to replicate this finding.

The combination of GPS and accelerometer data can be challenging. Methodological issues such as, low battery power, signal drop out, subject noncompliance or misuse of the device, can cause a loss of data. There are also monetary and time costs for elements, such as employing personnel to check the validity and completeness of the data (Oliver, Badland, Mavoa, Duncan, & Duncan, 2010). Furthermore, when looking to add GPS data requires an additional unit on top of the accelerometer device, it is an additional layer of complexity for the research participant.

Without a doubt, this combination of technologies cannot replace questionnaires, diaries, or interviews, which will always provide valuable information on subjects' self-reported activity and perception. Rather, they will gather more information, which is unattainable with these more traditional research tools and therefore, enrich findings. As concluded by Rainham *et al* (2008): "the use of wearable GPS-enabled technologies represents a logical next step in assessment of the association between place and health".

In agreement with most studies consolidating the use of accelerometer-based physical activity and GPS units, more studies of the type are necessary to replicate current findings and further determine the merits of using GPSs with accelerometers. In

keeping with this idea, further research with accelerometer-GPS combined data, along with performance-based and self-reported measures would not only benefit the development of this combined technology, it would also provide an in-depth understanding of the interrelations between intrapersonal and environmental factors related to mobility and activity limitations.

3.6 Literature Review Synthesis

In summary, pain appears to decline after TKA even though studies still demonstrate variation in the results. Mobility and activity levels on the other hand, do not seem to improve as expected by the patients, although the results in this case vary as well. Although many studies have tried to find the associations between TKA and pain, joint ROM, level of activity, and mobility, the methods used in these studies varied considerably. Thus, prohibiting any attempt to summarize the data precisely.

Different methods are often insufficient to fully quantify the progression after surgery and this, in addition to the variation of tests and instruments used may be why there is so much discordance in the literature regarding the association between TKA and pain, mobility and participation in activities. Moreover, it is difficult to measure patient satisfaction, as dissatisfaction may be a manifestation of unrealistic expectations. It is even possible that patients do not want to appear ungrateful to the hospital staff for the operation, such as was found by (Woolhead *et al.*, 2005). Nonetheless, the fact remains that a variety of measures (i.e. self-report, performance-based and real-world) are of great importance in providing a more complete pain, mobility and activity profile following TKA.

There are many problems in relation to TKA, which must still be addressed. As Wylde (2007) put it: "the reason for so many patients having medically unexplained pain and poor function after TKA is currently one of the unanswered conundrums of orthopaedics."

4 GOALS AND OBJECTIVES

Despite the fact that TKAs are commonly used to treat knee OA in growing population with a larger age gap, little is known about the effects and impacts of this practice on the daily lives of people after surgery, especially at one year post TKA. As of yet there are few longitudinal studies with comprehensive outcome assessments of the impact of TKA on mobility, activity and function and its trajectory across time before and after surgery, using multiple types of measures. The goal of this study is to provide insights into outcome assessments that can be used to capture changes and identify remaining functional deficits after TKA so that targeted interventions can be provided. The proposed pilot study is a precursor to this longitudinal study and will explore the feasibility and sensitivity of a battery of outcome measures to explore the impact of TKA on mobility, pain and the return to activities following surgery in patients suffering from knee OA. As a pilot study, this research project seeks to explore the feasibility of the protocol used in this project for a larger study, that is to say, to uncover the strengths and weaknesses of the instruments used as well as assess time and resource problems that can arise during the main study (i.e.

the length of time to fill out the questionnaires, refusal rates, eligibility criteria, etc.). This pilot study will help cover potential human and data management problems such as what happens when the equipment breaks down and evaluate the appropriateness of the instruments used to assess TKA or similar interventions. Additionally, we hope to find the appropriate sample size and to make recommendations for future studies using the same protocol.

The research project's specific objectives are the following:

1) Describe and compare functional performance, mobility and activity profiles in subjects with knee osteoarthritis who are: 1) awaiting TKA; 2) who have received a TKA 6-18 months ago; and 3) a comparison group of healthy active adults using a battery of self-reported, performance-based and real-life mobility and activity outcomes measures;

2) Assess the feasibility and variability across groups of the measures used;

3) Analyze the relationship between self-reported, performance-based and real-life mobility and activity measures.

5 RESEARCH QUESTIONS AND HYPOTHESES

The research project's research questions and hypotheses are the following:

1) Are present and residual impairments comparable between individuals with knee OA awaiting TKA (pre-TKA group), individuals who have had the surgery 6-18 months ago (post-TKA group) and a population of age-matched healthy active individuals (comparison group)? As this is a pilot study we don't have clear hypotheses to test.

However, we expect differences between groups, confirming the presence of residual deficits and impairments 6-18 months post TKA compared to the pre-TKA group and the comparative group of healthy, active individuals.

2) What are the strengths and weaknesses of the types of measurements used? Seeing as we will be applying a type of measure (ecological) that has only recently been introduced to this population, we expect to have difficulties with the data collection in terms of patient compliance and technical difficulties with the device.

3) Is there a relationship between self-report measures, performance-based measures, and ecological measures? As this is a pilot study we don't have clear hypotheses to test. However, we expect similar levels of correlations as reported in the literature between performance-based measures and self-reported outcome measures and low or bad correlations between self-reported outcome measures and real life mobility and activity.

6 METHODOLOGY

6.1 RESEARCH DESIGN

This study will use a descriptive correlational design to compare a group of 15 pre-TKA patients, a group 15 post-TKA patients and a group of 15 healthy older adults. Groups will be compared on a battery of self-report, performance-based and ecological outcome measures of functional performance, and mobility and activity levels.

6.2 SAMPLE AND RECRUITMENT STRATEGY

6.2.1 Pre-Total Knee Arthroplasty (Pre-TKA) and Post-Total Knee Arthroplasty (Post-TKA) Participants

Pre-arthroplasty and post-arthroplasty subjects will be recruited in two ways by convenience sampling. Firstly, through targeted advertising in the community (posters) and secondly, through an orthopedic clinic at the *Centre Hospitalier Universitaire de Sherbrooke*. A form (Appendix 14) describing the research project will be made available to patients who can choose to be contacted, by filling out their contact information, if they wish to receive more information on the research project. The research assistant will contact, by phone, the individuals who wish to be informed on the study. Individuals who then wish to participate in the research project and who meet the eligibility criteria will make an appointment with the research assistant at that time. Those who do accept will be given the proper ethical documentation and information at the first meeting. We will identify 30 subjects by these techniques (15 pre-TKA and 15 post-TKA).

6.2.2 Active (comparison) Group

Participants in this group will be recruited through targeted advertising in the community (by posters), by convenience sampling. If the subject accepts, he or she will be given the proper ethical documentation and information at the first meeting. Subjects in the active group will then be asked to complete, in person, the SF-12 questionnaire to ensure they fit the criteria. We will identify 15 subjects by this technique.

6.2.3 Inclusion Criteria

Pre-TKA group

- Knee OA
- On the waiting list for unilateral total knee arthroplasty
- Capacity to understand, read and express themselves in French

Post-TKA group

- Knee OA
- Between 6 and 18 months post unilateral total knee arthroplasty at time of recruitment
- Capacity to understand, read and express themselves in French

Active (comparison) group

- 30-60 minutes of moderate aerobic activity a day, 5 days a week or 30-60 minutes of vigorous aerobic activity, 3 times a week (according to The American College of Sports Medicine).
- Capacity to understand, read and express themselves in French

6.2.4 Exclusion Criteria

- Surgery affecting mobility within the next 6 months (except pre-TKA group)
- Disease affecting mobility (cardiovascular, neurological, musculoskeletal)
- Lower-limb fracture or amputation within the past 6 months

6.3 Order and Estimated Completion Time of Tests and Questionnaires

Data collection will take place in three sessions, each seven days apart.

Table 4. Order and Estimated Completion Time of Tests and Questionnaires

Variables	Visit 1 Day 1	Visit 2 Day 8	Visit 3 Day 15
Consent, demographics	X		
Self-reported			
MoCA, GDS, FCI, SF-12	X		
LSAQ, IPAQ, SPQ, KOOS*, QDSA*		X	
Performance-based			
UG, CST, 6MWT, SCT			X
Quadriceps force, power, work			X
BMI			X
WIMuGPS	←	———	→

* KOOS and QDSA are not completed by the active group

First Meeting

The first meeting will take place at the participants' home. Informed consent will be obtained. Participants will fill out five questionnaires (Montreal Cognitive Assessment-MoCA, Geriatric Depression Scale-GDS, Functional Comorbidity Index-FCI and Short-Form 12 Health Survey-SF12). The active group subjects will be excluded from the study if they do not obtain a SF-12 score for physical function and mental function above the 50th percentile. The WIMuGPS device will be given to the participant and there will be an orientation session on the use and function of the WIMuGPS.

Second Meeting

The second meeting will take place seven days after the first meeting and will once again take place at the participants' home. This meeting will consist solely of completing questionnaires (International Physical Activity Questionnaire-IPAQ, LSA,

Social Participation Questionnaire-SPQ, Knee injury and Osteoarthritis Outcome Score questionnaire-KOOS and Questionnaire de Douleur Sainte-Antoine-QDSA). The researcher will also check the WIMuGPS to make sure it is functioning properly, as well as answer any questions the subjects may have.

Third Meeting

The third meeting will take place seven days after the second meeting at the Research Center on Aging, where participants' body composition will be taken and participants will be subjected to performance tests (isometric and isokinetic tests, 8ft up and go, 30s Chair Stand Test, 6 Minute Walk Test & Stair Climb Test). The WIMuGPS device will be returned to the research assistant.

6.4 Intervention (Independent Variable)

The independent variable will be the group assignment (Pre-TKA vs Post-TKA vs Active).

6.5 Dependent Variables and Instruments

Table 5 lists the dependent variables that will be measured:

- Self-reported:
    - Pain - *Questionnaire de Douleur Saint-Antoine (QDSA) (unit-value)*
    - Joint function - *Knee Injury Osteoarthritis Outcome Score (KOOS) (unit-value)*
    - Activity level - *International Physical Activity Questionnaire (IPAQ)* (Met-minutes per week)

- Life space - *Life Space Assessment Questionnaire (LSA) (unit value)*
- Social participation - *Social Participation Questionnaire (SPQ) (days of activities per month)*

- Performance-based measures
  - Quadriceps femoris force (QFF) normalized for weight (Nm/kg)
  - Quadriceps femoris power (QFP) normalized for weight (W/kg)
  - Quadriceps femoris work (QFW) normalized for weight (J/kg)
  - Lower limb strength and endurance - *30 sec chair stand test* (number of repetitions)
  - Balance and gait - *8ft Up and go* (seconds)
  - Aerobic fitness-*Six-Minute Walk Test (6MWT) (meters)*
  - Stair climbing capacity-*Stair Climb test (SCT) (seconds)*
- Ecological measures
  - Number of recorded days
  - Total recorded time
  - Active time per hour of recording
  - Time at home per hour of recording
  - Time at home active per hour of recording
  - Time not at home active per hour of recording
  - Global standard deviation ellipse maximum distance (km)
  - Global standard deviation ellipse area (km^2)

Table 5.
Dependent Variables and Instruments

Tests	Acronym	Variable
Body impedance analysis		BMI (kg/m^2)
Self-reported		
Montreal Cognitive Assessment	MoCa	Self-Reported Cognitive Health (/30)
Geriatric Depression Scale	GDS	Self-reported Depressive Symptoms (/30)
Functional Co morbidity Index	FCI	Self-Reported Comorbidity (/17)
Life Space Assessment Questionnaire	LSAQ	Self-Reported Life Space (/120)
Short-Form 12 Health Survey	SF-12	Self-Reported Functional Status (/100)
International Physical Activity Questionnaire	IPAQ	Self-Reported Physical Activity Level (total physical activity MET-minutes/week)
Social Participation Questionnaire	SPQ	Self-Reported Social Participation (sum of days of activities per month, /100)
Knee Injury Osteoarthritis Outcome Score	KOOS	Patient-Reported Knee Function (/100)
Questionnaire de douleur St-Antoine	QDSA	Patient-Reported Pain (Pain Rating Index, /58)
Performance-based		
8 ft Up and Go	UG	Balance and Gait (s)
30 Seconds Chair Test	CST	Lower Limb Strength and Endurance (repetitions)
6 Minute Walk Test	6MWT	Gait and Aerobic Fitness (m)
Stair Climb Test (X3)	SCT	Stair Climbing Capability (s)
Muscle Quality		
Isometric and isokinetic tests	BIODEX	Quadriceps femoris force (Newton-meter, Nm), power (watt, W) and work (joule, J)
Ecological		
Natural Mobility	WIMuGPS	• Number of recorded days • Total recorded time • Active time per hour of recording • Time at home active per hour of recording • Time outside active per hour of recording • Standard deviation ellipse of mobility sphere - maximum distance (km) - area (km^2)

The following section will briefly describe the instruments for each dependent variables selected. The instruments used are available in the Appendix section.

6.5.1 Self-Reported Variables

Self-Reported Functional Status

Short Form 12 Health Survey (SF-12) (Appendix 1)

Self-reported functional status will be evaluated with the French version of the Short-Form 12 Health Survey (SF-12). The SF-12 is a shorter version of the SF-36 and measures functional health and wellbeing from the patient's perspective on the past 4 weeks (Ware & Sherbourne, 1992). The SF-12 is self-explanatory and takes three to seven minutes to complete the 12 questions. The survey delivers two scores: a mental component and a physical component. A low score indicates a lower level of functioning. The SF-12 explains 94% of the variance of the SF-36. The test-retest (2 week) correlations of 0.89 and 0.76 were reported for the physical component and the mental component, respectively. According to Spilker (1996), a difference of more than 10 on the SF-36 is needed to be considered clinically relevant.

Patient-Reported Pain

Questionnaire Douleur Sainte-Antoine QDSA) (Appendix 9)

General pain will be assessed with the help of the French version of the McGill Pain Questionnaire (questionnaire douleur Sainte-Antoine). There is also a knee specific pain component in the KOOS questionnaire (see below).

The QDSA is a patient-reported questionnaire, which specifies subjective pain experience using 61 words divided into three sub-classes: sensory (9), affective (7) and

evaluative (1). The participant chooses one word per sub-class and quantifies it on a scale of 0-5. Three measures can be derived: 1) PRI-R, the sum of the numerical values assigned to each word descriptor is kept. In this scoring system, the word of each subclass which implies the least pain is given a score of 1 and the next one a value of 2, and so on (Melzack & Katz, 2001). These values are summed and the higher the score, the more intense the pain; 2) PRI-P, a 0 to 5 scale from the pain description section: no pain, mild, discomforting, distressing, horrible or excruciating. Each word's scale value is summed and the total is kept; 3) PRI-S, which is the sum of mean scale values. That is, the average of the PRI-P and PRI-R is kept; and 4) number of words chosen. In the case of the McGill Pain Questionnaire, for the total, sensory, affective, and average pain scores, high intra-class correlations were demonstrated (0.96, 0.95, 0.88, and 0.89, respectively) (Grafton, Foster, & Wright, 2005). In this study, the PRI-S will be kept to score the subjects' pain level.

Patient-Reported Joint Function

Knee Osteoarthritis injury Outcome Score (KOOS) questionnaire (Appendix 8)

Patient-reported knee function will be assessed with the Knee Osteoarthritis injury Outcome Score (KOOS) questionnaire. The KOOS (Roos, et al., 1998) contains 42 self-administered questions that are self-explanatory and cover five patient-relevant dimensions: pain, other disease-specific symptoms, ADL function, sports and recreation function, and knee-related quality of life. It is an extended version of the WOMAC questionnaire. It was developed for use with younger and/or physically active patients with knee injury and/or osteoarthritis but it is also valid for elderly patients with TKAs (Roos & Toksvig-Larsen, 2003). WOMAC pain questions are included in the KOOS

subscale "pain", the WOMAC stiffness questions are included in the KOOS subscale "other disease-specific symptoms", and the WOMAC subscale " function" is equivalent to the KOOS subscale "ADL". Standardized options are given (5 Likert boxes) and each question gets a score from 0 to 4. The score of each subscale is summed up and divided by the possible maximum score for each subscale. A total score of 100 indicates the absence of symptoms and a score of 0 indicates important symptoms. The KOOS questionnaire is self-administered and takes about 10 minutes to complete. This questionnaire has been successfully used with elderly subjects and the stability of the original English questionnaire is high with an ICC > 0.75 (Roos & Toksvig-Larsen, 2003). The reproducibility of measurements of all subscales of the French KOOS was good to excellent, with ICC ranging from 0.755 to 0.914 (Ornetti, et al., 2008).

Self-Reported Activity and Mobility

International Physical Activity Questionnaire (IPAQ) (Appendix 6)

The goal of the IPAQ is to provide a set of well-developed instruments that can be used internationally to obtain comparable estimates of physical activity (PA). The PA assessment is undertaken across four domains: leisure time PA, domestic and gardening (yard) PA, work-related PA and transport-related PA. MET-minutes/week will be kept to measure the volume of activity. A MET is the ratio of the rate of energy expended during an activity to the rate of energy expended at rest.

The long form, self-reported IPAQ questionnaire has acceptable validity when assessing levels and patterns of PA in healthy adults. Strong positive relationships were observed between the activity monitor data and the IPAQ data for total PA (rho = 0.55, $P < 0.001$) and vigorous PA (rho = 0.71, $P < 0.001$), but a weaker relationship for

moderate PA (rho = 0.21, P = 0.051). Craig, et al. (2003) and Hagstromer, Oja, & Sjostrom (2006) used Spearman's correlation coefficients (rs) to show that the IPAQ reliability was very good (rs = 0.8). As well, the short and long versions produce comparable results (rs=0.67) and the criterion validity (rs = 0.30) is, at least, comparable to most other self-reported questionnaires.

Self-Reported Life-Space

Life-Space Assessment Questionnaire (LSA-F) (Appendix 5)

The LSA was designed to assess the spatial extent of mobility of older adults and is designed to be administered by an interviewer. It consists of nine questions assessing whether the subject has been to a particular area in their environment during the past three days. The nine items represent an ordinal step in increasing life-space (bedroom to immediately outside the home to outside town, etc.). The responses are either yes or no (score of 1 for "yes" and 0 for "no"). The score therefore ranges from 0 to 9, and the larger scores signify a larger life-space. The life-space composite score based on life-space level, frequency score and use of technical or human assistance (ranging from 0 to 120) will be retained to assess subjects' life-sapce.

Test-retest reliability for the questionnaire is of 0.80 (Stalvey, et al., 1999). The French version (LSQ-F) will be used in this research project. It's content validity results confirm it to be equivalent meaning for most questions. The test–retest reliability was excellent for the composite score (intraclass correlation coefficient=0.87) and revealed moderate to substantial concordance for 18/20 items (k=0.47–0.73; P_a>57.5%) (Auger, et al., 2009).

Self-Reported Social Participation

Social Participation Questionnaire (SPQ) (Appendix 7)

Social participation will be estimated using a questionnaire based on the Statistics

Canada Participation and Activity Limitation Survey (Statistics Canada, 2007). This questionnaire allows respondents to indicate their frequency of execution of ten social activities (visiting relatives or friends, practicing a hobby outside, attend a community center or recreation, etc.) on a Likert scale with 5 levels: almost every day, at least once a week, at least once a month, less than once a month and never. Each response is then transformed into a number of days per month (almost every day: 20, at least once a week: 6, at least once a month: 2, less than once a month: 1 and never: 0) and the total score of the questionnaire is the sum of days of activities per month (Richard, Gauvin, Gosselin, & Laforest, 2009). The metrological qualities of the tool are good and have been studied with the elderly in urban areas. Internal consistency of the scale, established through application of item response theory, was high at 0.91. (Richard, *et al.*, 2009).

6.5.2 Performance-Based Measures

Measured Quadriceps Femoris Muscle Force, Power and Work

Quadriceps force, power and work will be measured bilaterally during a protocol of voluntary maximum effort on an isokinetic dynamometer. The functioning of a dynamometer such as Biodex (isokinetic unit) is based on two main principles:

a) Controlling speed: a constant speed is imposed on the body segment.

b) Adapting to the resistance: the resistance varies to insure maintenance of the chosen speed.

Data can be recorded in different values (Sayers, 2008):

a) The moment of maximum force (Newton-meter, Nm), which corresponds to the moment where force is highest during the movement;

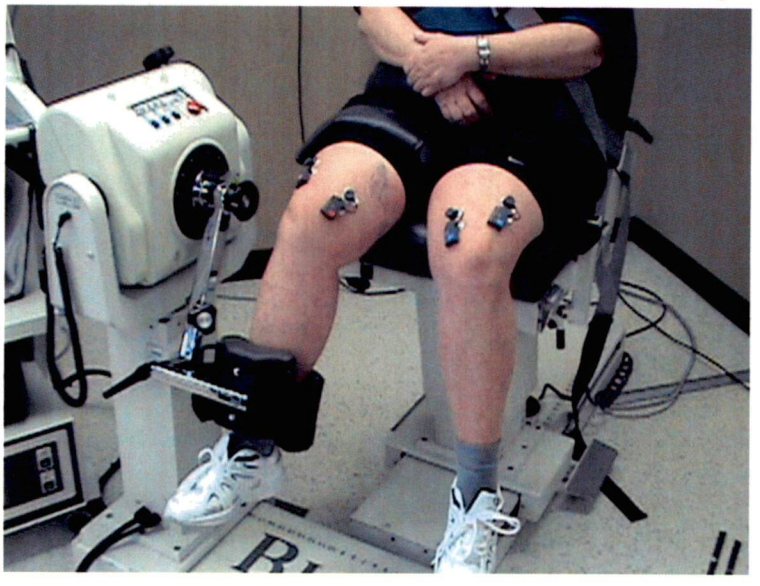
b) Maximum power (watt, W) corresponds to the performed work per time unit. It is the product of the moment of force and angular speed.

c) Maximum work (joule, J) corresponds to the integration of the surface below the curve of the moments of force.

These variables will be kept for the evaluation of quadriceps force, power and work, respectively.

During the evaluation of maximum force, power and work of the quadriceps, two tests will be performed. The first is an isometric test, which will measure quadriceps force. The second is an isokinetic test, which will measure quadriceps power and work. The subject's starting position will be sitting, with the back supported, hips at 120°. The trunk, pelvis and thighs of the side being assessed will be safely strapped and stable. Before the tests begin, each subject will warm up with five minutes of stationary bicycling. The isokinetic dynamometer is calibrated acording to the manufacturer's instructions.

Figure 11. Participant seated on the Biodex© isokinetic dynamometer



Maximum Isometric Contractions - Quadriceps Femoris Force (QFF)

Non-painful maximum force of the quadriceps muscles will be measured with the Biodex Dynamometer. Non-painful maximum isometric contractions will be performed with the knees flexed at 30 degrees. Two repetitions of 10 seconds each will be done followed by a one-minute rest period. Before beginning the actual data recording, the subjects will have one isometric contraction to familiarize themselves with the test. Subjects will gradually increase effort until maximum force is reached. The subjects will be told prior to cease if pain is felt. Pain symptoms will be noted in the subject's file.

Isokinetic Contractions - Quadriceps Power Femoris Power (QFP) and Work (QFW)

Following the isometric test, an isokinetic evaluation of the quadriceps will take place. The subject will receive the instruction to begin performing 10 successive knee extension movements (concentric contractions) at maximum effort at a speed of 180

degrees/second. The returning swing to flexed position will take place at a speed of 300 degrees/second. Three series will be performed with a 1-minute rest period between each set. Prior to this test the subjects will be allowed five contractions to familiarize themselves with the test to ensure their best performance possible.

QFF, QFP and QFW will be calculated by adding the best score of each leg together. Scores will be normalized with the individuals weight.

Balance and Mobility - 8ft. Up and Go (UG) Test

The 8ft. UG test is a modified version of the Timed Up and Go (TUG) test. The test requires the subject to rise from a chair, walk 8 ft to and around a cone, walk back and sit down in the shortest time possible. The amount of time (s) taken to complete the test is recorded and kept. For this research project, two trials will be performed. A cane or walker may be used if it is the usual mode of walking. Pushing-off from the chair is allowed. The test-retest for the 8ft. UG is very high (0.95) (Rikli & Jones, 1999).

Lower Body Muscle Endurance and Strength - 30 Seconds Chair Stand Test

The chair stand test assesses lower body muscle endurance and strength. The subject begins the test sitting on the chair with arms crossed at the wrists and held up to their chest. The subject must stand up completely, then completely back down. This is repeated for 30 seconds. The number of repetitions completed is kept. The participants will complete one trial. Jones, Rikli, & Beam (1999) determined the test-retest reliability of the 30 seconds chair-stand test to be good (ICC = 0.84 for men and 0.92 for women). They also investigated the 30 seconds chair test's validity by comparing it to the 1RM leg press (adjusted to body weight). Correlations of 0.79 and 0.71 for the men and women were found, respectively. The chair stand test can detect differences among age

groups (F=4.4; *df*=2,187; P<0.01) and activity levels (F=21.9; *df*=1,188; P<0.0001, which suggests construct validity (Jones, et al., 1999).

Aerobic Fitness - Six-Minute Walk Test (6MWT)

The 6MWT is easy to administer and consists of measuring the distance (m) that is walked by the subject in six minutes. Subjects will be asked to walk up and down a hallway at a comfortable pace. Subjects are allowed to rest if necessary. Only one trial will be performed. Reliability of data obtained with the 6MWT was determined in a representative sample of community dwelling elderly (Harada, Chiu, & Stewart, 1999). The validity of the 6MWT was demonstrated by comparing the measurements with those obtained with cycle ergometer exercise testing (Spearman rho, r = 0.58) and with functional classification (Spearman rho, r = 0.50 - 0.60) (Guyatt, *et al.*, 1985).

Stair climbing capacity - Stair Climb Test

The stair climb test is a simple test, easy to perform and very informative of the subject's locomotor performance in daily activities such as getting up from a sitting position, walking and changing directions, and climbing stairs. We will follow the guidelines put in place by Perron, Malouin, & Moffet (2003). The test consists of 4 tasks: 1) standing up from a chair and walking 3 m; 2) ascending a staircase (10 stairs); 3) turning around and descending stairs; 4) walking back to the chair, turning and sitting down. Subjects will perform the test three times in a row. The amount of time (s) taken to perform all three repetitions in a row will be kept. Subjects are allowed to take breaks and use the handrail as well as a walking aid.

6.5.3 Ecological Activity and Mobility Variables

Measured activity and mobility levels

Measured mobility and activity levels will be established with the help of a device called the Wireless Inertial Measurement unit with GPS (WIMuGPS) (Boissy *et al.*, 2011) (see page 40, appendices). This device will objectively assess natural life-space and active time. The WIMuGPS is a wireless device with multiple integrated sensors capable of storing long-term data. The sensors and components of this device include an inertial measurement unit provided with a triaxial accelerometer, gyroscope, magnetometer, a global positioning system (GPS) SIRFIII, a microprocessor, 2-gig μSD card and a lithium rechargeable battery with charge indicator and USB port. The energy consumption of the WIMuGPS is of 40 mA/h, which offers approximately 15 hours of continuous recording before requiring a charge. The data collected by the sensors allows for many interesting variables to be extracted. However, for this research project we are solely interested in extracting active-time and life-space variables from the WIMuGPS, therefore no gyroscope or magnetometer information will be kept.

The device will be worn at the trunk for 14 days, during all waking hours of the day except during water activities. The methods for life-space and activity assessment consist of a 4-step process (Figure 17). Sensor recordings are first aggregated and aligned temporally. Signal processing and data reduction is then performed on GPS data and accelerometer data to identify and classify recordings as part of conditions and events (ex: in-home, active or inactive etc…). Activity and mobility outcomes are then computed for each day of recording. Average values from multiple daily recordings for these outcomes are used as representations of the life-space and mobility of the individual for a given sampling period. Out of the 14 days of recording, days 1, 7 and 14

will not be kept seeing as these were the days during which there were visits for the research projects. Additionally, for a day to be considered complete, 500 minutes (8.3 hours) of recording is required.

Active-Time and Life-Space (WIMuGPS)

Active-time is defined as the time during which the subject is physically active, such as during the preparation or execution of an action (Choquette, Hamel, & Boissy, 2008). By combining frequency and intensity of movement variables, as well as orientation of body segments it is possible for an accelerometer (in this case the WIMuGPS) to monitor a range of different movements, including gait, sit-to-stand transfers, postural sway and falls, physical activity levels and to identify and classify movements performed by subjects (de Bruin, Hartmann, Uebelhart, Murer, & Zijlstra, 2008).

Life-space is defined as the area in which subjects travel in a chosen time frame. It will also be calculated with the help of the longitude and latitude data recorded by the GPS (WIMuGPS). For further detail on the WimuGPS data analysis see Boissy, Brière, Gingras-Hill et al. (2012). The variables that will be kept are the following:

- Number of days recorded
- Total recorded time (hrs)
- Active time per hour of recording (%)
- Time at home per hour of recording (%)
- Time at home active per hour of recording (%)
- Time not at home active per hour of recording (%)
- Standard deviation ellipse maximum distance (Km)

- Standard deviation ellipse area (km^2)

Number of days recorded

A minimum of 500 minutes per day is necessary to be considered a day.

Total recorded time:

Total recorded time includes all 14 days of recording except the three days where participants met with the research assistant, therefore, potentially 11 days. Again, the days with less than 500 minutes (8.3 hours) recorded will not be included in his study Total recorded time will be expressed in hours.

Active time per hour of recording (%)

Active time is only computed in the area where the subject is not in a vehicle, including the home and outside the home. A subject is considered to be in a vehicle if he or she is moving at a speed higher than 10 km/h for longer than 90 seconds. This is turn helps filter short stops while in a vehicle. Active time can be segmented into different categories: at home and outside the home. Active time per hour of recording is calculated by dividing the total amount of active time by the amount of time recorded and is expressed in percent of an hour.

Time at home per hour of recording (%)

With the help of the GPS, hotspots are created where an individual spends a certain amount of time. In fact, a hotspot is first created when an individual spends more than 120 seconds in a radius of 10m. Then all spots within a 100m distance are

combined into larger ones and considered a hotspot. By this method, it is possible to capture where the participant spends most of their time. This hotspot is considered to be the individual's home. Time at home per hour of recording is calculated by dividing the total amount of time at home active by the amount of time recorded and is expressed in percent of an hour.

Time at home active per hour of recording (%)

When an individual is found to be in his home hotspot, (with the help of the GPS) and being active (with the help of the accelerometer), the individual will be considered to be active at home. Time at home active per hour of recording is calculated by dividing the total amount of time active at home by the amount of time recorded and is expressed in percent of an hour.

Time not at home active per hour of recording (%)

When an individual is not considered to be at home, according to the GPS, and is being active, according to the accelerometer, the individual will be considered to be active not at home. Time not at home active per hour of recording is calculated by dividing the total amount of time not at home active by the amount of time recorded and is expressed in percent of an hour.

Standard deviation ellipse area a.k.a Ellipse area (km^2)

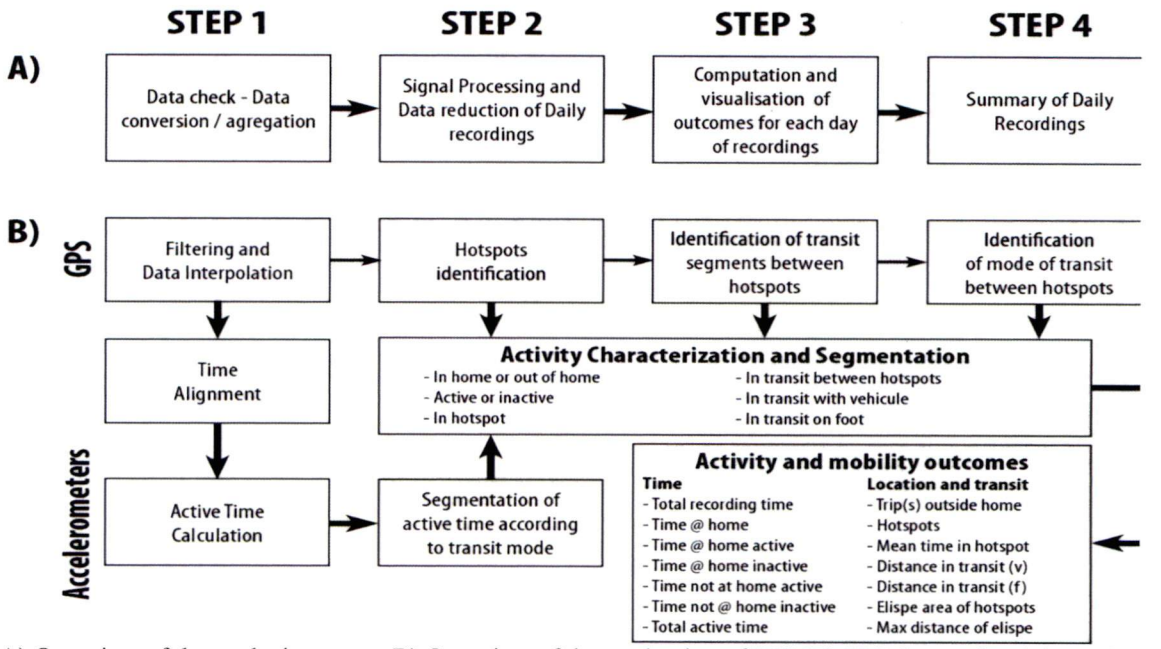
To calculate the standard deviation ellipse we used the technique implemented by crimestat ® (Levine, 2007). That is, the linear distance from each point to the mean center point is calculated, and then an ellipse is drawn around one standard deviation

from the center point all the while accounting for skewed distributions, to minimize the extra space that could appear. Thereby, surrounding 68% of hotspots. The area of the ellipse is calculated and represents the individual's life-space. For the rest of the research project, this variable will be referred to as ellipse area and will be expressed in km^2.

Standard deviation ellipse maximum distance a.k.a Ellipse maximum distance (km)

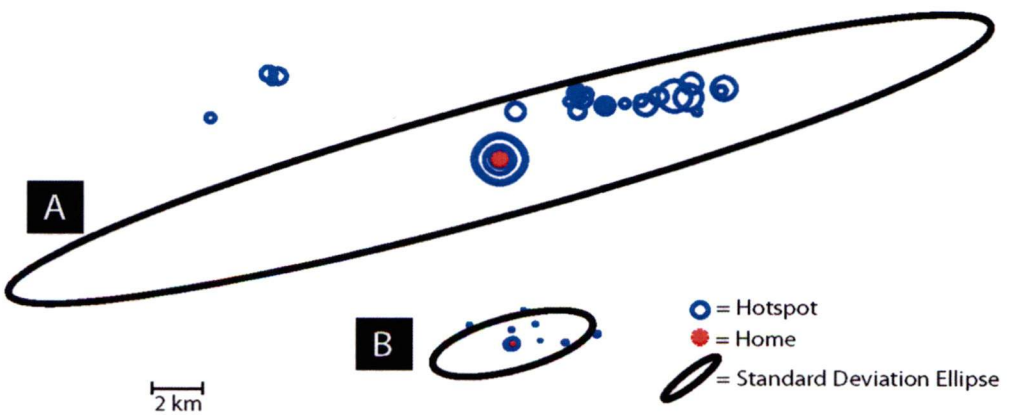
One the ellipse is calculated, the distance between the home hotspot (which is located at the center of the ellipse) and the furthest edge of the ellipse, provide us with the maximal distance traveled in 68% of all the data, by the participant (by any mode of transportation). This is referred to as the standard deviation ellipse maximum distance. For the rest of the research project, this variable will be referred to as ellipse maximum distance and expressed in km.

Figure 12. Overview of the WIMuGPS analysis process



A) Overview of the analysis process B) Overview of data reduction of WIMU-GPS data and activity and mobility outcomes computed from daily recordingsBoissy, Brière, Gingras-Hill *et al.*, 2012

Figure 13. Geospatial distributions of the weighted hotspots



Geospatial distributions of the weighted hotspots visited of two participants. A) Participant A, B) Participant BBoissy, Brière, Gingras-Hill *et al.*, 2012

6.6 Control Variables

The following variables will be measured as to reduce their potential influence on the results: body composition, depressive symptoms, comorbidity and cognitive health.

6.6.1 Body Composition - Height and Body Impedance Analysis

Subjects' height will be measured with a ribbon accurate to 0.5 cm. Body impedance analysis will be performed with the InBody 230 and the variables kept include: weight (kg) and body mass index (BMI) (kg/m^2).

6.6.2 Depressive Symptoms - Geriatric Depression Scale (GDS) (Appendix 3)

Depressive symptoms will be measured with the help of the Geriatric depression scale (GDS) (See page 6, appendices). The GDS consists of 30 questions. For each question the subject must answer if the statement corresponds to the state in which they were last week (yes or no). To calculate the score, one point is given for each negative answer to questions 1, 5, 7, 9, 15, 19, 21, 27, 29 and 30 and one point for each positive answer to the other questions. A score of 0 to 10 = absence of depression, 11 to 20 = light depression, 21 to 30 = moderate or grave depression (Bourque, Blanchard, & Vézina, 1990; Tremblay, Savard, Casimiro, & Tremblay, 2004) performed a psychometric study of the French version of the GDS and found the stability to be of 0.7. The internal consistency is of 0.89, which demonstrates good homogeneity. Criterion validity correlation is of 0.63 compared to the Beck questionnaire and

construct validity is confirmed by factor analysis to be one-dimensional.

6.6.3 Comorbidity - Functional Comorbidity Index (FCI) (Appendix 4)

The FCI (see page 8, appendices) was designed to predict physical function and is the best choice of questionnaire to measure comorbidity with physical function as the outcome (Groll, Heyland, Caeser, & Wright, 2006). The FCI is an 18-item list of diagnosis, for which 1 point is given for each diagnosis that is present. A score of 0 indicates no comorbid illness, and a score of 18 indicates the highest number of comorbid illnesses.

6.6.4 Cognitive Health - Montreal Cognitive Assessment (MoCA) (Appendix 2)

The MoCA (see page 5, appendices) was designed to assess light cognitive dysfunctions. The MoCA evaluates the following functions: attention, concentration, executive functions, memory, language, visuo-constructional skills, conceptual thinking, calculations, and orientation. The maximum score is of 30 and a score of 26 or above is considered normal. The sensitivity and specificity of the questionnaire for detecting mild cognitive impairment is 90 percent and 87 percent, respectively (Nasreddine, et al., 2005).

6.7 Analysis

All WimuGPS data will be processed in WIMuStudio and MatLab. Statistical analyses will be performed in SPSS.

The research project's first objective is to describe and compare functional performance, mobility and activity profiles in subjects with knee OA who are: 1) awaiting TKA; 2) who have received a TKA 6-18 months ago; and 3) an active group of age-matched healthy adults from the general population. If the distribution is normal, we will perform single factor (group) analysis of variance (ANCOVA), while controlling for confounding variables (age, comorbidities, sex and BMI), if necessary. If the data is not normally distributed we will perform non-parametric Kruskall-Wallis and Mann-Whitney analyses between the groups.

The second objective of this research project is to explore the feasibility of the protocol used in this project for a larger study and establish the variability of the measures used. To do so, we will look at the descriptive statistics and analyze missing data and non-compliance events.

The research project's third objective is to explore the correlation between self-reported measures, performance-based measures and real-life mobility and activity profiles (ecological measures) of the pre-TKA, post-TKA and active group. Pearson correlations will be analyzed to explore this association if the data is normally distributed. In the event where the data is not normally distributed we will perform non-parametric Spearman's Rho correlations.

6.8 Ethical Considerations

The ethical committee of the Centre de Recherche Clinique Étienne-Le Bel from the Centre Hospitalier de Sherbrooke (CHUS) has evaluated and approved this research project (Appendix 10) as well as the ethical committee of the Centre de Services

Sociaux Sherbrooke - Institut Universitaire de Gériatrie de Sherbrooke (CSSS-IUGS) (Appendix 12). Participants in the pre and post TKA groups will sign the CHUS's consent form (Appendix 11) and participants in the active group will sign the CSSS-IUGS's consent form (Appendix 13).

7 RESULTS

This pilot study was comprised of three objectives: 1) describe and compare functional performance, mobility and activity profiles in the three groups; 2) explore the feasibility of a larger research project; and 3) explore the relationship between self-reported, performance-based and real-life mobility and activity profiles (ecological measures) of the pre-TKA group, post-TKA group and active group. The following sections will present the results of each objective. Following the socio-demographic data, the differences between groups will be presented. The feasibility of the protocol will then be discussed for each type of measure and their variability, that is, self-reported measures, then performance measures, and ecological measures. Finally, the last part of the results section will be on the correlations between the types of measures.

7.1 SOCIO-DEMOGRAPHIC DATA

Recruitment and data was collected from September to November for the active group and from April to July for the pre-TKA and post-TKA groups. The reason we were limited to these times of the year was due to climate. As most individuals tend to stay more indoors during the winter and we wanted to observe individuals' life-space and active time, we decided to keep our data collection to warmer climate. ,

We recruited 12 participants in the active group, 10 in the post-TKA group and 6 in the pre-TKA group. Table 6 describes the recruited participants' characteristics including age, sex, BMI, functional health and GDS score. Most recruited participants were female

(n=16), with an average age of 66.54 ± 7.1. There were no differences between the groups in terms of age or sex. The average BMI was 31.7 ± 7.7 and this was quite different among the active (25.4 ± 3.0) and pre-TKA group (34.3 ± 7.2) ($p < 0.001$) as well as between the active and post-TKA group (37.6 ± 8.3) ($p < 0.001$). The MoCA scores were good for the active, pre-TKA and post-TKA groups (27.33 ± 1.5, 24.83 ± 3.25 and 26.4 ± 3.53, respectively). No differences were observed among the groups for the MoCA. Comorbidities were different between the active (1.33 ± 0.99) and pre-TKA group (3.33 ± 1.37) ($p = 0.007$) and the active and post-TKA (2.7 ± 1.64) ($p = 0.05$). The pre-TKA (10.5 ± 8.53) had a higher score on the GDS than the post-TKA group (5.6 ± 4.17) and the active group (1.58 ± 1.93). Again, differences were found between the active and pre-TKA group ($p = 0.024$) and the active and post-TKA group ($p = 0.002$). However, no participants were considered to have severe depressive symptoms. Only one participant, a pre-TKA participant, worked full-time. Due to our sample size and the use of non-parametric statistics, the above variables were not controlled in the group comparison.

The following sections will look at the results on the difference across the groups, the variability of results and the feasibility of the protocol, and the correlations among variables.

Table 6. Socio-Demographics and Perceived Health Across Groups

Variable/Group	Active (n=12)	Pre-TKA (n=6)	Post-TKA (n=10)	Overall (n=28)
Age	64.42 ± 3.66	65.17 ± 9.24	69.9 ± 8.1	66.54 ± 7.05
Sex	7 F	5 F	4 F	16 F
Retired	12	5	10	27
BMI	25.43 ± 3.01	34.27 ± 7.22*	37.61 ± 8.33*	31.67 ± 7.68
MoCA	27.33 ± 1.5	24.83 ± 3.25*	26.4 ± 3.53*	26.46 ± 2.82
Comorbidities	1.33 ± 0.99	3.33 ± 1.37*	2.7 ± 1.64*	2.25 ± 1.53
GDS	1.58 ± 1.93	10.5 ± 8.53*	5.6 ± 4.17*	4.93 ± 5.73

* Significantly different ($p \leq 0.05$) with the active group

7.2 DIFFERENCES ACROSS GROUPS

The following section will look at the first two objectives. That is, first, we will describe the differences found between the active, pre-TKA and post-TKA groups. Second, we will describe the variability in the data and the feasibility of this protocol. We first performed non-parametric Kruskall-Wallis analyses, as our sample size is small and our data was not normally distributed. On the variables indicated as significantly different among the three groups, we performed Mann-Whitney analyses.

7.2.1 Self-reported Measures

Self-reported measures included SF-12 physical and mental components, IPAQ, life-space, and social participation. Patient (pre-TKA and post-TKA) specific self-reported measures included the KOOS and QDSA. Median, inter-quartile range (IQR) and range values for each group of participants on the self-reported measures are presented in Table 7. Differences between groups are illustrated in Figure 14. Median and range values for each group of patients (pre-TKA Vs post-TKA) for the KOOS and QDSA are presented in Table 8.

SF-12 physical component median scores were 53.20, 37.10, and 43.60 for the active group, pre-TKA group and post-TKA group, respectively. The SF-12 mental component median scores were 56.40, 42.45, and 55.40 for the active group, pre-TKA group and post-TKA group. The IPAQ median scores were 4710, 1197, and 2372 for the active group, pre-TKA group and post-TKA group. The life-space median scores were 10, 45, and 40 for the active group, pre-TKA group and post-TKA group. The social participation median scores were 32.50, 26.50, and 22.00 for the active group, pre-TKA group and post-TKA group.

The KOOS other symptoms component median scores were 41 and 82. for the pre-TKA and post-TKA groups, respectively. The KOOS pain component median scores were 38 and 84 for the pre-TKA and post-TKA groups, respectively. The KOOS activities of daily living component median scores were 50 and 88 for the pre-TKA and post-TKA groups, respectively. The KOOS function in sports and recreation component median scores were 5.00 and 50.00 for the pre-TKA and post-TKA groups, respectively. The KOOS quality of life component median scores were 25.00 and 81.00 for the pre-TKA and post-TKA groups, respectively. The QDSA median scores were 32.75 and 2.50 for the pre-TKA and post-TKA groups, respectively.

Following a Kruskall-Wallis analysis of the self-reported data between groups, all variables except the life-space score and social participation score were shown to be significantly different ($p < 0.01$) among groups. The active group had significantly better scores compared to the pre-TKA and post-TKA groups on the SF12 physical component score ($p < 0.001$) and on the IPAQ score ($p = 0.003$) and ($p = 0.006$), respectively (Figure 14). Additionally, the active group had a better SF12 mental component score than the pre-TKA group ($p = 0.018$).

The post-TKA group had significantly better scores on the KOOS-other symptoms score ($p < 0.001$), KOOS-pain score ($p < 0.001$), KOOS-activities of daily living score ($p = 0.001$), KOOS-function in sports and recreation score ($p < 0.001$), KOOS-quality of life score ($p < 0.001$) and the QDSA ($p < 0.001$). Thus, the post-TKA group had a significantly higher score (healthier) on all components of the KOOS questionnaire and a lower score (less pain) on the QDSA (Table 8).

Table 7.
Self-Reported Measures

Variable	Statistic	Active	Pre-TKA	Post-TKA
SF12 Physical	N	12	6	10
	Median	53.20	37.10*	43.60*
	IQR	5.28	12.93	16.33
	Range	47.80 - 57.80	25.90 - 45.20	30.80 - 53.40
SF12 Mental	N	12	6	10
	Median	56.40	42.45*	55.40
	range	6.53	12.32	9.97
	Range	47.20 - 61.60	30.40 - 61.10	31.60 - 62.20
IPAQ	N	12	6	10
	Median	4710.00	1197.00*	2371.50*
	IQR	3723.97	2063.87	3185.62
	Range	1709.50 - 9393.00	109.50 - 2722.00	45.00 - 4833.00
Life-Space	N	12	6	10
	Median	88.00	79.00	91.00
	IQR	10	45.12	39.75
	Range	62.00 - 110.00	39.00 - 98.00	64.00 - 110.00
Social-Participation	N	12	6	10
	Median	32.50	26.50	22.00
	IQR	23	8.5	38.75
	Range	19.00 - 80.00	15.00 - 37.00	5.00 - 54.00

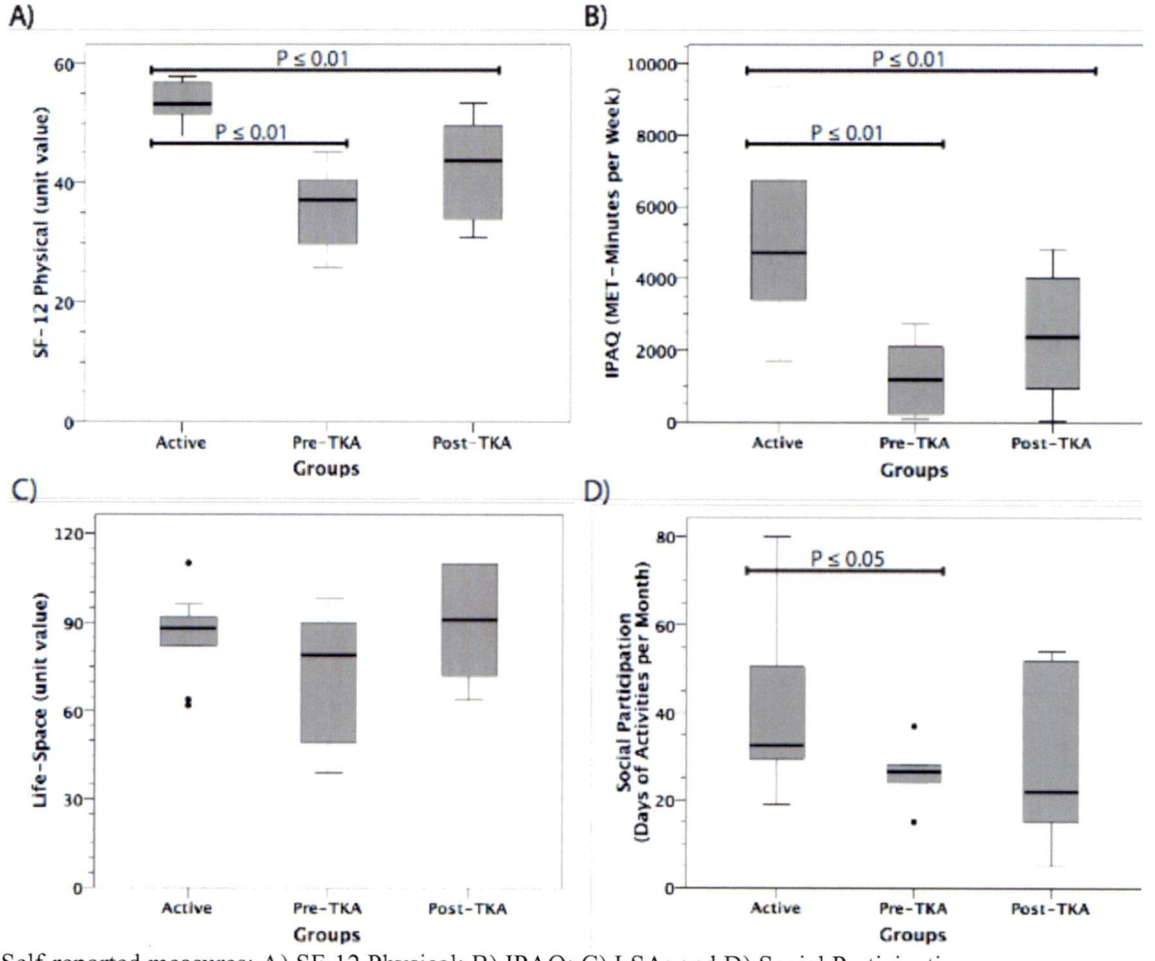
* Significant difference ($p \leq 0.05$) with the active group

Table 8.
KOOS and QDSA for Pre-TKA and Post-KA Groups

Variable	Statistic	Pre-TKA	Post-TKA
KOOS other symptoms	N	6	10
	Median	41.00*	82.00
	IQR	17.5	11.75
	Range	36.00 - 61.00	68.00 - 93.00
KOOS pain	N	6	10
	Median	37.50*	84.50
	IQR	21.25	22
	Range	22.00 - 56.00	61.00 – 100
KOOS ADL	N	6	10
	Median	49.50*	87.50
	IQR	19.25	20.75
	range	37.00 - 75.00	66.00 - 100.00
KOOS function	N	6	10
in sports and recreation	median	5.00*	50.00
	IQR	21.25	61.25
	range	0 - 25.00	25.00 - 100.00
KOOS quality of life	N	6	10
	median	25.00*	81.00
	IQR	19.88	22
	range	19.00 - 62.50	50.00 - 100.00
QDSA	N	6	10
	median	32.75*	2.50
		9.87	9.63
	range	23.00 - 44.50	0 - 18.00

* Significant difference($p \leq 0.05$) between groups

Figure 14. Boxplot of Self-Reported Measures



Self-reported measures: A) SF-12 Physical; B) IPAQ; C) LSA; and D) Social Participation.

Variability and Feasibility

Self-reported measures were properly completed by all participants in the study (active, n = 12; pre-TKA, n = 6; and post-TKA, n = 10). The data were clean and properly completed with the supervision of a research assistant. Participants did not complain about the time it took to complete the numerous questionnaires. As we can see in Figure 14, the active group participants, which under the inclusion criteria set in this study had to meet a minimum requirement of self-reported physical activity, showed significant variation in their score on the IPAQ and social participation instruments. The

active group's scores on the IPAQ range from 1709.5 to 9393.0 and on the social participation questionnaire from 19 to 80.

7.2.2 Performance-Based Measures

Performance-based measures included 8 ft. up and go test, 30-second chair stand test, six-minute walk test, stair climb test (x3), QFF, QFP and QFW. Median, IQR and range values for each group of participants on the performance-based measures are presented in Table 9. Differences between groups are illustrated in Figure 15 and Figure 16.

Median scores for the 8 ft. up and go ranged from 5.82 to 10.64 to 8.69 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the 30 second chair stand test ranged from 14.00 to 6.00 to 10.50 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the stair climb test ranged from 39.42 to 146.52 to 69.52 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the QFF ranged from 2.24 to 1.42 to 1.23 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the QFP ranged from 5.68 to 4.76 to 2.84. Median scores for the QFW ranged from 18.73 to 12.27 to 10.97 for the active group, pre-TKA group and post-TKA group, respectively.

According to the Kruskall-Wallis analysis for performance data, there exist significant differences ($p \leq 0.01$) for all performance measures (up and go test score, 30 second chair stand test score, six-minute walk test score, stair climb test (x3), QFF, QFP and QFW among the active, pre-TKA and post-TKA groups.

As expected, the active group performed better on all tests compared to the pre-TKA and post-TKA groups. The up and go score was better in the active group ($p < 0.001$) compared to the pre-TKA group and the post-TKA group. The active group also

performed better on the chair stand test compared to the pre-TKA ($p = 0.001$) and post-TKA group ($p = 0.003$), as well on the 6-minute walk test ($p < 0.001$) and the stair climb tests ($p < 0.001$) (Figure 15). Additionally, the active group had a significantly higher QFF than the pre-TKA ($p = 0.027$) and post-TKA ($p < 0.001$) groups as well as higher QFW ($p = 0.052$) and ($p = 0.001$), respectively. The active group also had better QFP ($p = 0.002$) than the post-TKA group (Figure 16).

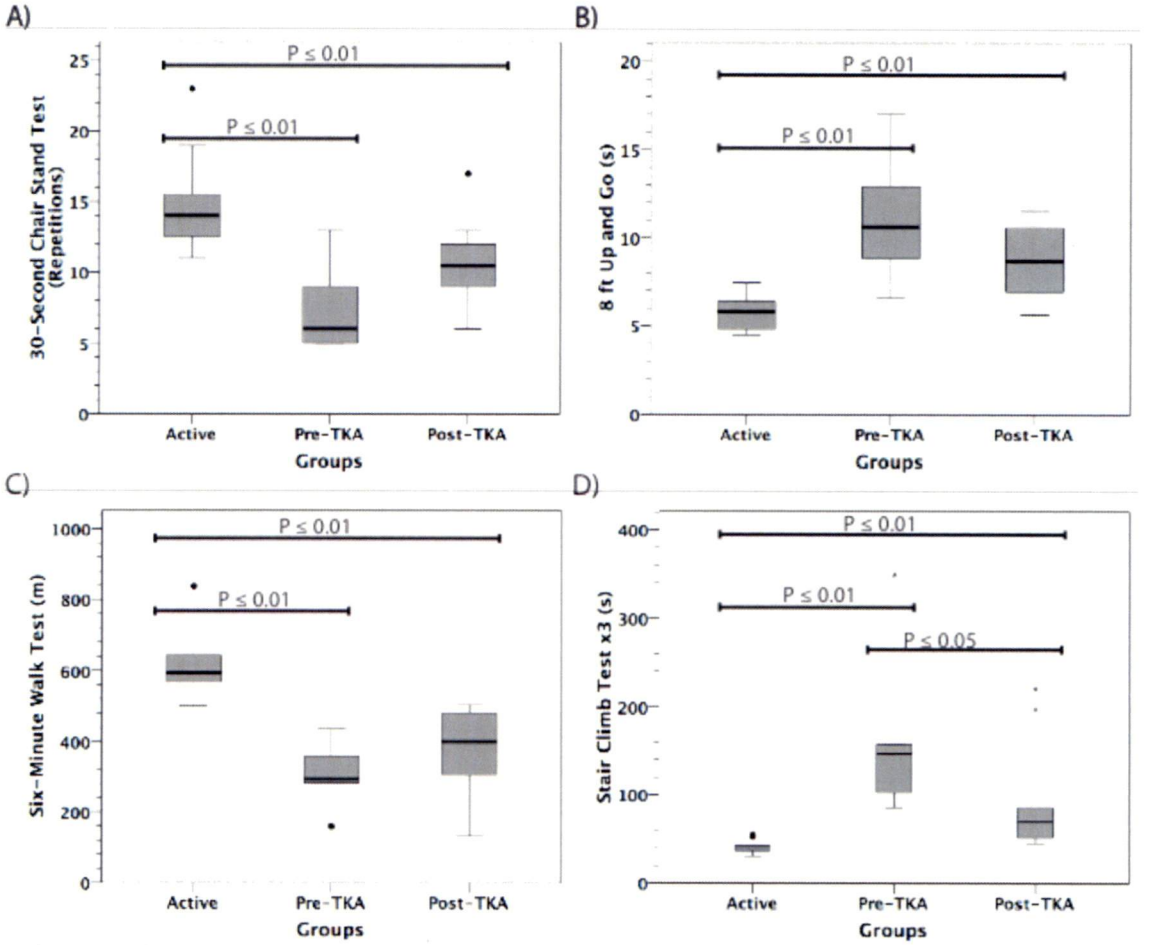
The post-TKA group had a better performance on the stair climb test (x3) than the pre-TKA group ($p = 0.018$) (Figure 15D). No other differences were observed between the pre-TKA and post-TKA groups in regards to performance measures.

Table 9.
Performance-Based Measures

Variable	Statistic	Active	Pre-TKA	Post-TKA
8 ft. Up & Go (s)	n	12	6	10
	median	5.82	10.64*	8.69*
	IQR	1.66	5.68	3.89
	range	4.50 - 7.45	6.58 - 17.07	5.63 - 11.56
30 second Chair Stand Test (repetitions)	n	12	6	10
	median	14.00	6.00*	10.50*
	IQR	3.5	5	3.5
	range	11.00 - 23.00	5.00 - 13.00	6.00 - 17.00
Six-Minute Walk Test (m)	n	12	6	10
	median	593.00	294.00*	399.50*
	IQR	80	126.75	206
	range	500.00 - 838.00	160.00 - 436.00	132.00 - 504.00
Stair Climb Test (x3) (s)	n	12	6	10
	median	39.42	146.52*‡	69.52*
	IQR	6.81	106.63	62.54
	range	30.85 - 54.58	85.92 - 349.22	45.47 - 220.96
Quadriceps Femoris Force (Nm/kg)	n	11	5	9
	median	2.24	1.42*	1.23*
	IQR	0.43	0.96	0.66
	range	1.78 - 3.13	0.99 - 2.40	0.94 - 2.23
Quadriceps Femoris Power (W/kg)	n	11	5	9
	median	5.68	4.76	2.84*
	IQR	2.86	4.32	2.43
	range	4.26 - 8.50	3.40 - 9.33	1.93 - 7.10
Quadriceps Femoris Work (J/kg)	n	11	5	9
	median	18.73	12.27*	10.97*
	IQR	13.3	9.2	6.6
	range	13.91 - 61.99	9.89 - 24.69	5.07 - 26.59

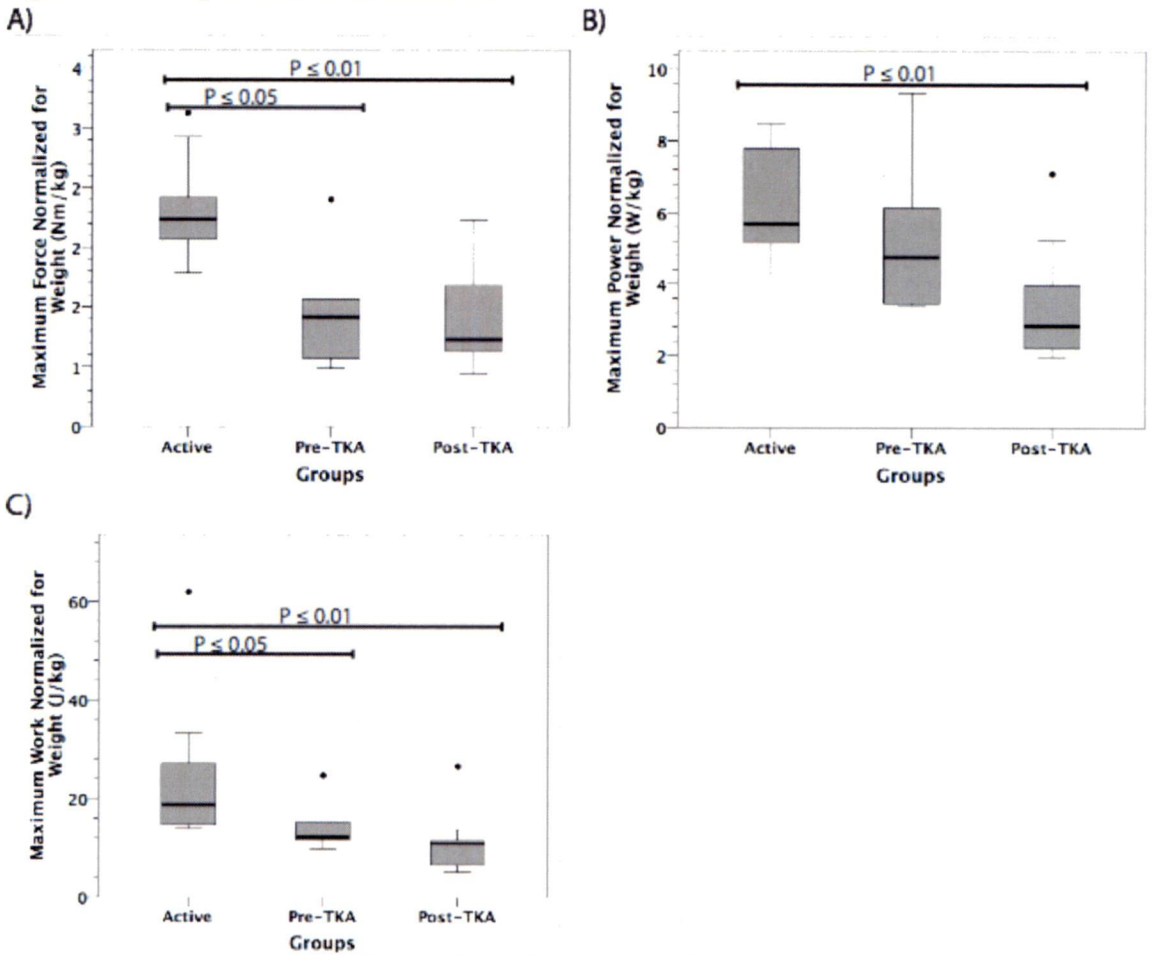
* Significant difference ($p \leq 0.05$) with active group
‡ Significant difference ($p \leq 0.05$) with post-TKA group

Figure 15. Boxplot of Performance-Based Measures



Performance-based measures: A) 30 Second Chair Stand Test; B) 8 ft. Up and Go; C) 6-Minute Walk Test; and D) Stair Climb Test (x3).

Figure 16. Boxplot of Biodex Measures



Biodex measures: A) Quadriceps Femoris Force; B) Quadriceps Femoris Power; and C) Quadriceps Femoris Work for all groups (active, pre-TKA and post-TKA)

Variability and Feasibility

The performance measures were also well collected but not as complete as self-reported. There are limitations and difficulties when asking participants to be physically active, especially before or after a surgery. Nonetheless, there was only one subject per group who did not complete the isometric and isokinetic tests (QFF, QFP, QFW). In regards to the other performance tests, they were all performed in a timely and adequate fashion with no complaints or refusals from any of the participants. In the case of the healthy-active participant, it was more a question of comfort with the equipment, which the participant did not have. No pressure was put on the participant and therefore, the individual did not complete isokinetic and isometric tests. As for the pre-TKA and post-

TKA participants, it was a question of possible knee pain aggravation. Feedback from the participants in regards to the isometric and isokinetic tests was positive. A few pre-TKA and post-TKA participants felt slight knee pains in their knees but described it as habitual.

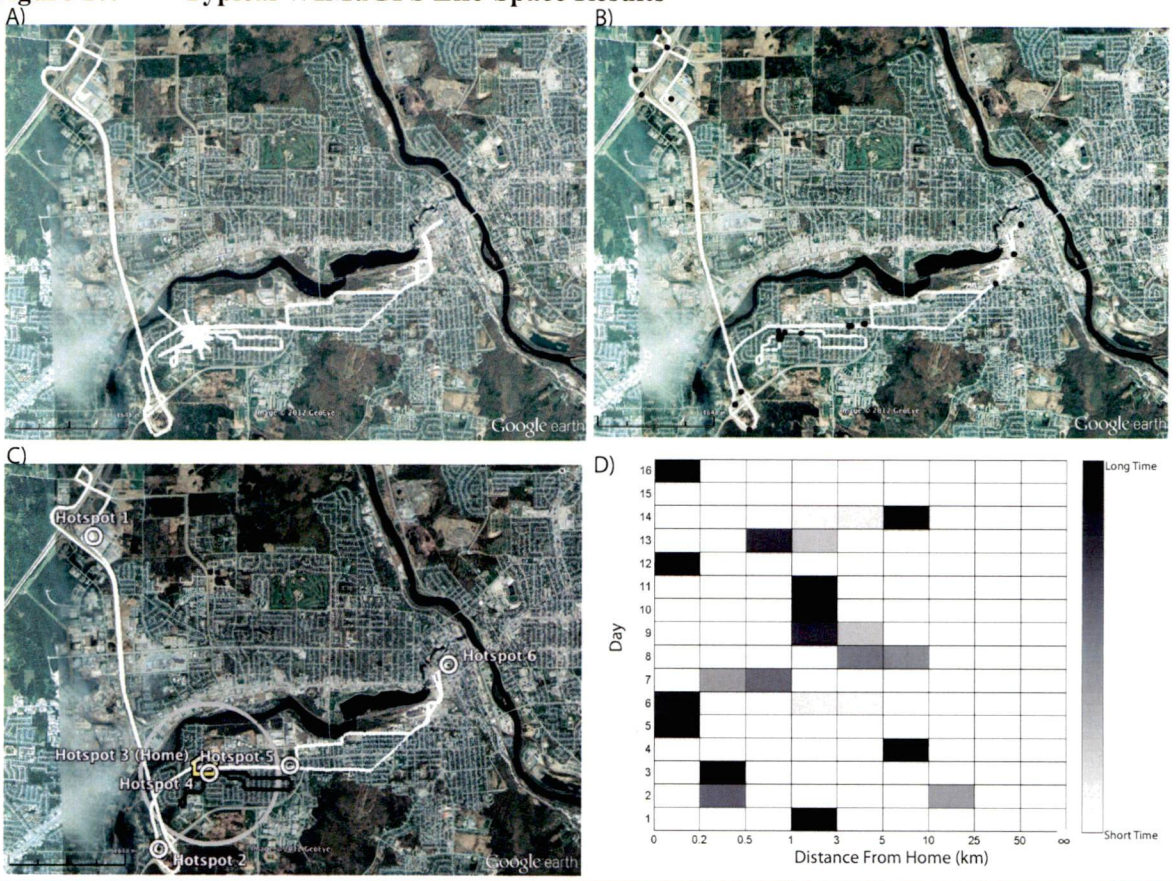
There was much variability seen in the performance tests. Particularly in the pre-TKA group on the 30-second chair stand test (5.00 repetitions to 13.00 repetitions), the 8 ft. up and go (6.58 s to 17.07 s) and QFP (3.40W/kg to 9.33 W/kg) and the post-TKA group on the six-minute walk test (132.00 m to 504.00 m).

7.2.3 Ecological Measures

Ecological measures included active time variables, as well as life-space variables. These variables include time at home, active time, time at home active, time not at home active, ellipse maximum distance, and ellipse area. Median, IQR and range values for each group of participants on the ecological measures are presented in (Table 10). Ecological life-space and activity results are illustrated in Figure 18, Figure 19 and Figure 20.

Figure 17 shows typical WIMuGPS life-space results for a day. Data collected by the accelerometer-GPS is first unfiltered. In this case we can see some segments aren't completed and some that are oscillated (mainly around the home) (Figure 17A). In Figure 17B, after filtering the data, it is possible to see the interpolated areas (black spots) and the oscillated segments have disappeared. The interpolated areas are then weighted out into hotspots, which are seen in Figure 17C. Active segments (black) are now distinguished from transportation segments (white). Additionally, an ellipse (grey) is created, which represents the participant's life-space. Figure 17D is a geospatial analysis of one participants daily hotspots and their distance from home. The darker the cell, the longer the participant spent in that hotspot.

Figure 17. Typical WIMuGPS Life-Space Results



ID	Day	Total Time (hrs)	Home (%)	Home Active (%)	Not Home Active (%)	Active (%)	Ellipse Area	Ellipse Maximum Distance
C11	7	12.34	20.64	3.18	14.22	17.46	3.38	1.30

Typical WIMuGPS life-space results: A) Unfiltered. B) Filtered and interpolated. C) Filtered with hotspots, ellipse (grey) and transportation segment (white) and active segment (black). D) Geospatial analysis of daily hotspots and their distance from home for one participant

Median scores for the time at home ranged from 45.71 to 74.87 to 49.90 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the active time ranged from 26.32 to 13.34 to 17.30 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the time at home active ranged from 15.62 to 10.07 to 7.32 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the time not at home active ranged from 11.56 to 4.06 to 8.17 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the ellipse maximum distance ranged from 9.29 to 4.42 to 22.46 for the active group, pre-TKA group and post-TKA group, respectively. Median scores for the ellipse area ranged from 88.61 to 11.20 to 106.32 for the active group, pre-TKA group and post-TKA group, respectively.

According to the Kruskall-Wallis analysis for ecological data, there exist significant differences ($p < 0.01$) among the groups for active time, time at home and not at home active. The active group demonstrated a higher amount of active time than the pre-TKA ($p = 0.005$) and post-TKA ($p = 0.002$) as well as more time not at home active than the pre-TKA ($p = 0.003$) and post-TKA group ($p = 0.033$). Not surprisingly, the pre-TKA spent more time at home ($p = 0.048$) than the active group (Figure 18).

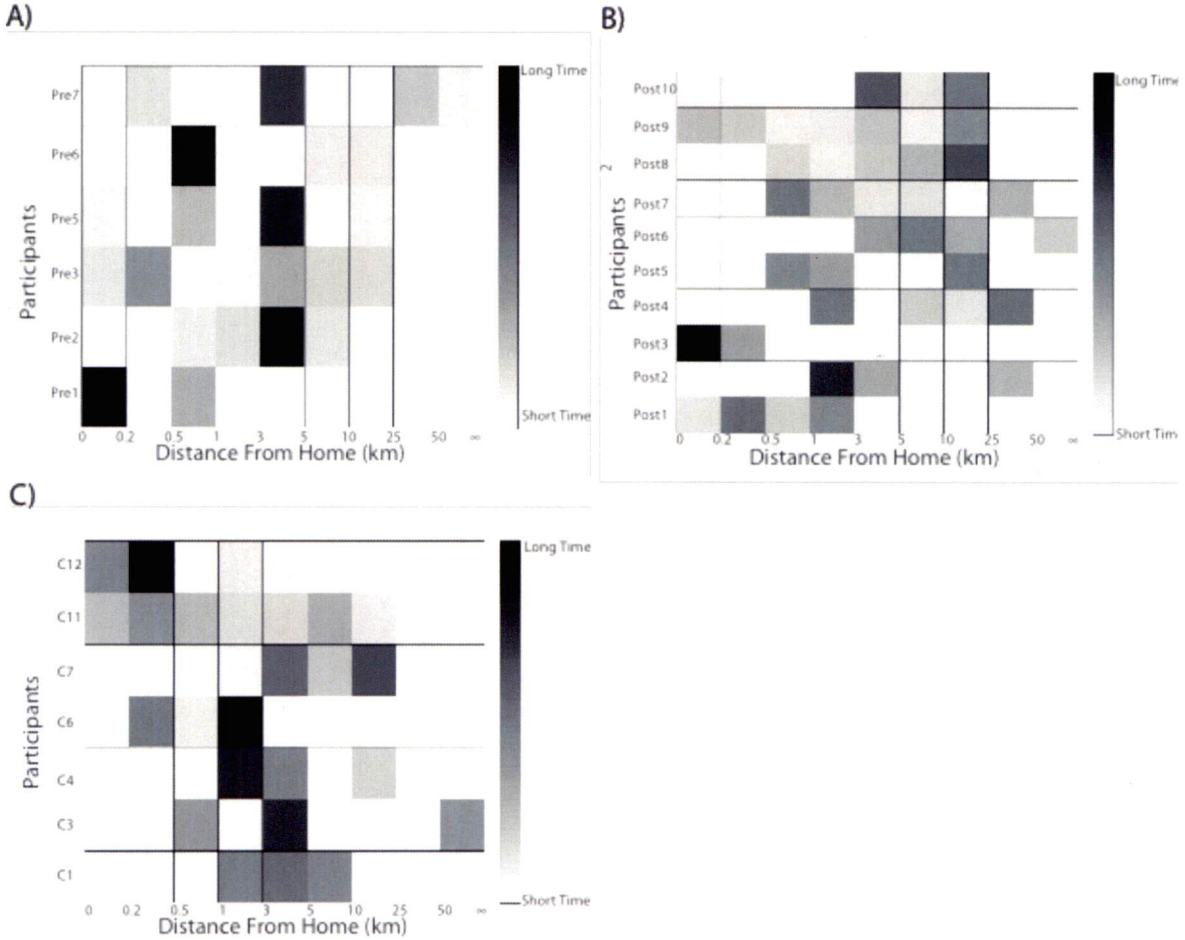
The post-TKA group was found to spend significantly more time not at home active ($p = 0.028$) than the pre-TKA. No other ecological variables were found to be different between these two groups.

Table 10.
Ecological Measures

Variable	Statistic	Active	Pre-TKA	Post-TKA
Time at Home (%)	n	7	5	10
	median	45.71	74.87*	49.90
	IQR	17.67	30.59	19.94
	range	1.81 - 78.24	43.85 - 85.51	30.37 - 87.32
Active Time (%)	n	7	5	10
	median	26.32	13.34*	17.30*
	IQR	10.8	13.65	8.52
	range	17.93 - 36.54	9.92 - 31.28	12.45 - 22.64
Time at Home Active (%)	n	7	5	10
	median	15.62	10.07	7.32
	IQR	12.19	6.42	4.52
	range	1.06 - 19.63	4.37 - 16.16	1.29 - 17.33
Time Not at Home Active (%)	n	7	5	10
	median	11.56	4.06*‡	8.17*
	IQR	10.06	7.84	6.07
	range	6.65 - 34.62	0.57 - 21.47	2.73 - 16.50
Ellipse Maximum Distance (km)	n	7	5	10
	median	9.29	4.42	22.46
	IQR	17.39	8.07	41.52
	range	0.31 - 19.78	0.18 - 21.55	0.21 - 118.02
Ellipse Area (km^2)	n	7	5	10
	median	88.61	11.20	106.32
	IQR	100.82	94.67	611.04
	range	0.16 - 118.84	0.04 - 345.02	0.04 - 2020.02

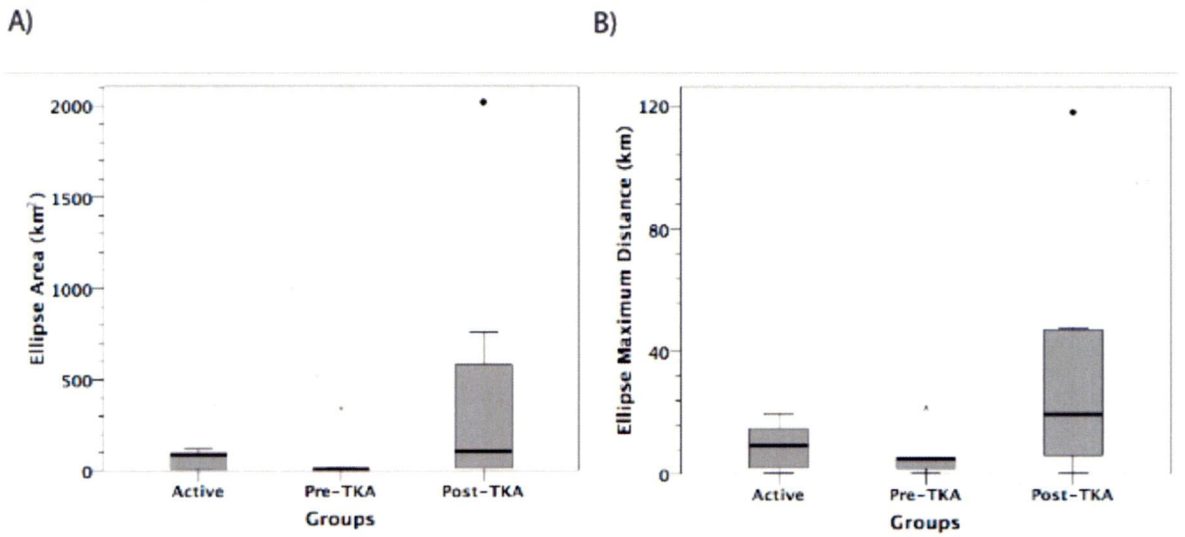
* Significant difference ($p \leq 0.05$) with active group
‡ Significant difference ($p \leq 0.05$) with the post-TKA group

Figure 18. Ecological (Life-Space) Measures: Geospatial Analysis of Hotspots



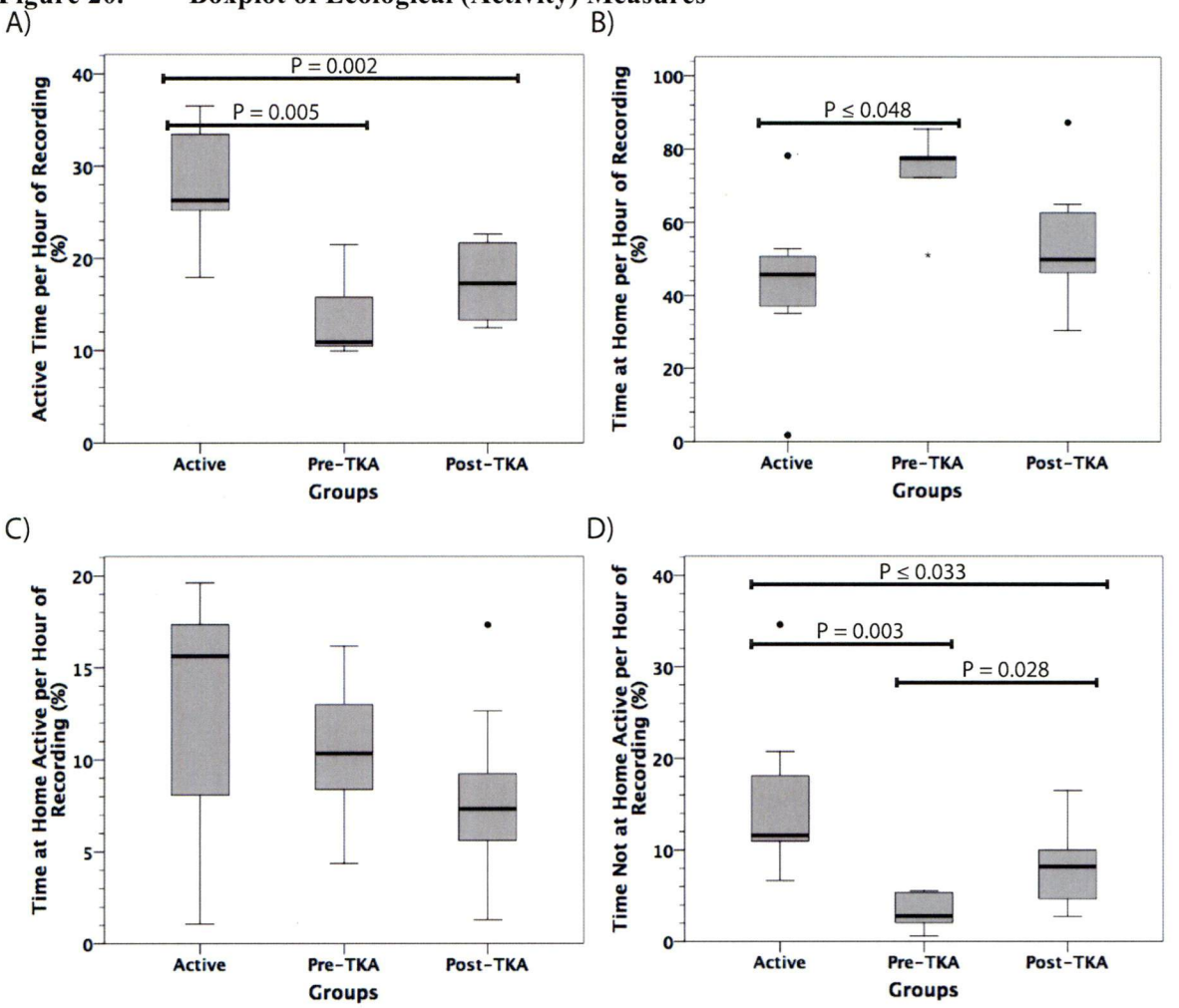
Ecological (life-space) measures: Geospatial analysis of hotspots distance from home: A) Pre-TKA group, B) Post-TKA group and C) Active group

Figure 19. Boxplot of Ecological (Life-Space) Measures: Statistical Geospatial Analysis



Ecological (life-space) measures: Statistical geospatial analysis A) Ellipse area; B) Ellipse maximum distance

Figure 20. Boxplot of Ecological (Activity) Measures



Ecological (Activity) Measures: A) Active-Time; B) Time at Home; C) Time at Home Active; and D) Time Not at Home Active.

Variability and Feasibility

Only six of the 12 potential active participants had enough days that were considered complete (more than 500 minutes of recording). This loss of data was due to confusion about the device in the first week of recording, as well as technical difficulties with the system. No pre-TKA or post-TKA data were lost. Much of the ecological, life-space data has extreme values, particularly for the time at home active for the active group (range from 1.06 to 19.63), pre-TKA group (range from 4.37 to 16.16) and post-TKA group (range from 1.29 to 17.33). The post-TKA group had much variability in both their

ellipse area (0.04 to 2020.02) and ellipse maximum distance (0.21 to 118.02) as we can see in Figure 19A and Figure 19B, respectively.

7.3 Correlations Among Variables

A Spearman's Rank Order correlation (Rho or r_s) was run to explore the relationships between the self-reported, performance-based and ecological measures used in this research project. Rho were computed from data on the 28 participants (active group (n=12); pre-TKA group (n=6) and a post-TKA group (n=10). The correlation matrix is presented in Table 11. Between all three types of measures, we see that the SF12 physical, IPAQ, six-minute walk test score, 8 ft. up and go score, stair climb test (x3) and 30 second chair stand test, active time and not at home active are all moderately to strongly correlated ($r_s = 0.54 - 0.76$, $p < 0.01$). The life-space score, social participation, ellipse distance, ellipse area were not found to have any correlation with any variable.

7.3.1 Correlations within specific categories of measures

In the case of patient-reported variables, pain (QDSA) had strong, significant correlations with the KOOS components ($r_s \geq -0.88$, $p < 0.01$). It had a slightly less strong, significant correlation with the mental component score of the SF12 ($r_s = .66$, $p < 0.01$). The IPAQ score had a moderately strong significant correlation ($r_s = 0.65$, $p < 0.01$) with the physical component score of the SF12. There were moderate to strong, statistically significant correlations ($r_s \geq 0.53$, $p < 0.01$) amongst all performance-based measures. Few ecological variables had significant correlations amongst one another. The most interesting

significant correlation was that between time at home and time active outside ($r_s = -0.84$, $p < 0.01$) and between active time and time active outside ($r_s = 0.76$, $p < 0.01$).

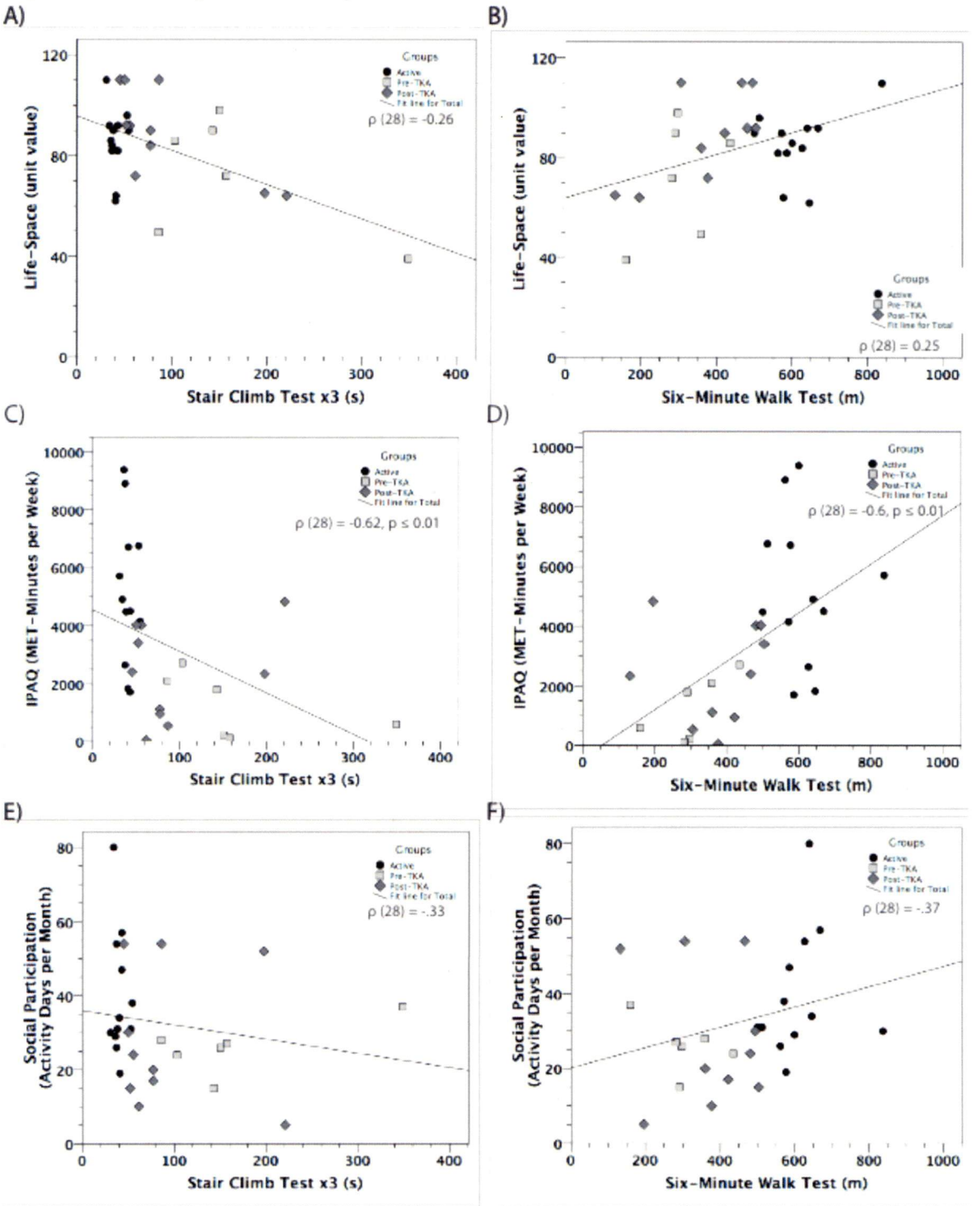
7.3.2 Correlations between types of measures

In the following section, computed Rho's between all three types of measures (self-reported, performance-based and ecological) will be explored. A scatterplot for the self-reported versus performance-based analysis, the self-reported versus ecological analysis and performance-based versus ecological analysis can be found in Figure 21, Figure 22 and Figure 23.

Self-reported Vs Performance-based

Four self-reported variables (SF-12 physical, KOOS pain, KOOS activities of daily living, and IPAQ) had moderately strong significant correlations ($r_s \geq 0.58$, $p < 0.05$) with the six-minute walk score, 8 ft. up and go score, stair climb test score and 30-second chair stand test score. This demonstrates a good relationship between the self-reported measures and performance measures. Interestingly, the SF12 physical score with the six-minute walk test score ($r_s = 0.76$, $p < 0.01$) and the 8 ft. up and go ($r_s = 0.76$, $p < 0.01$) had the strongest correlations, with the stair climb test (x3) close behind ($r_s = 0.73$, $p < 0.01$). The IPAQ correlations with the stair climb test (x3) score ($r_s = -0.62$, $p < 0.01$) and six-minute walk test ($r_s = 0.6$, $p < 0.01$) are represented in Figure 21C and Figure 21D. The life-space score (Figure 21A and Figure 21B) and social participation scores (Figure 21E and Figure 21F) were not correlated with any performance variables.

Figure 21. Scatterplot of Self-Reported Vs Performance-Based Measures

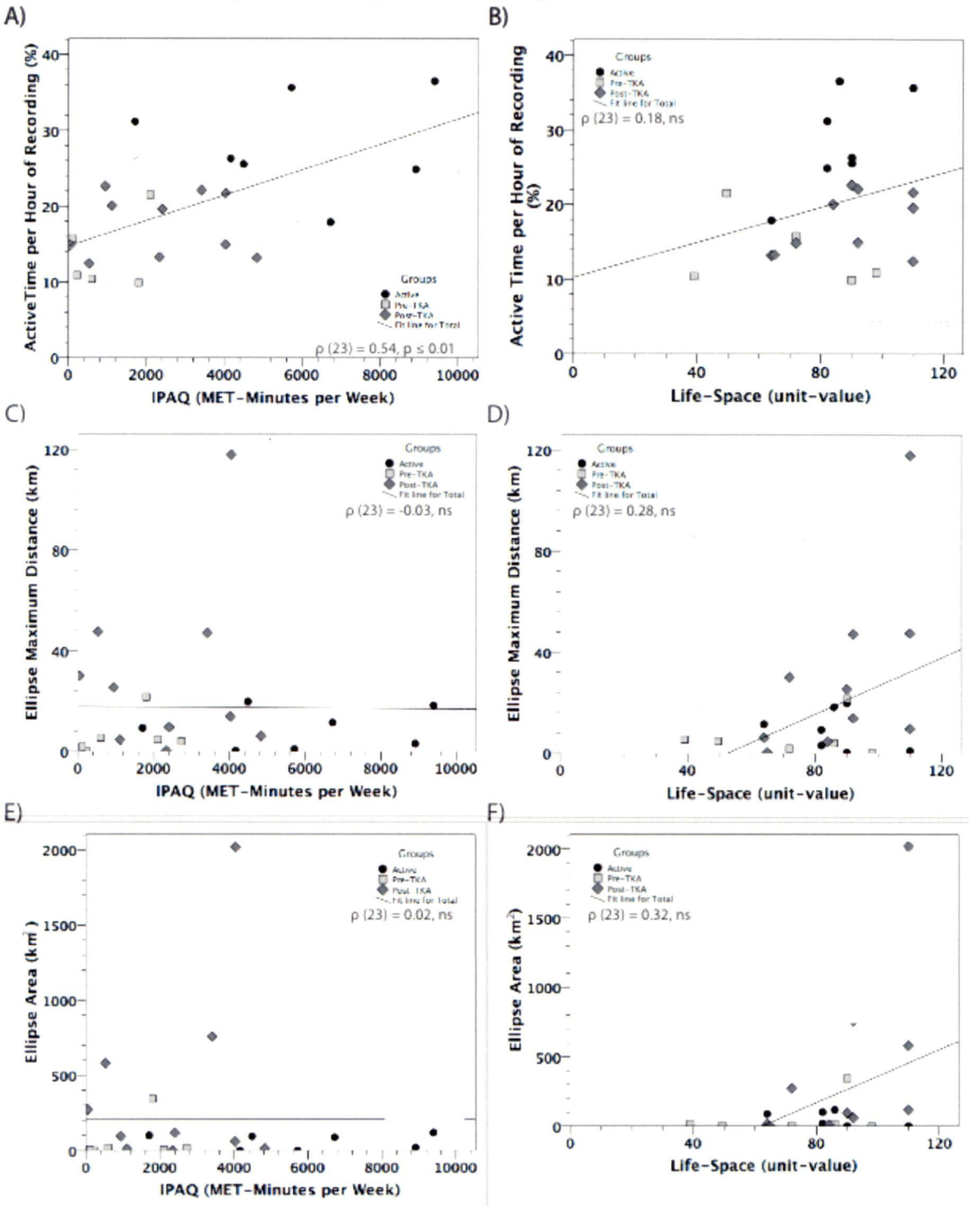


Self-reported measures (LSA, IPAQ and Social Participation) VS performance-based measures (6-Minute Walk Test and Stair Climb Test x3) for all three groups (active, pre-TKA and post-TKA).

7.3.3 Self-Reported *vs* Ecological

The most interesting significant correlations between self-reported variable and ecological variables were SF-12 physical score and *active time* ($r_s = 0.74$, $p < 0.01$) and IPAQ score and *active time* ($r_s = 0.54$, $p < 0.01$) (Figure 22A). *Time not at home active* was significantly correlated with the SF12 physical score ($r_s = 0.55$, $p < 0.01$) and IPAQ score ($r_s = 0.62$, $p < 0.01$) as well. Interestingly, neither the life-space score, the social participation score or the IPAQ score were correlated with the ellipse distance (Figure 22C and Figure 22D or ellipse area (Figure 22E and Figure 22F).

Figure 22. Scatterplot of Self-reported Vs Ecological Measures

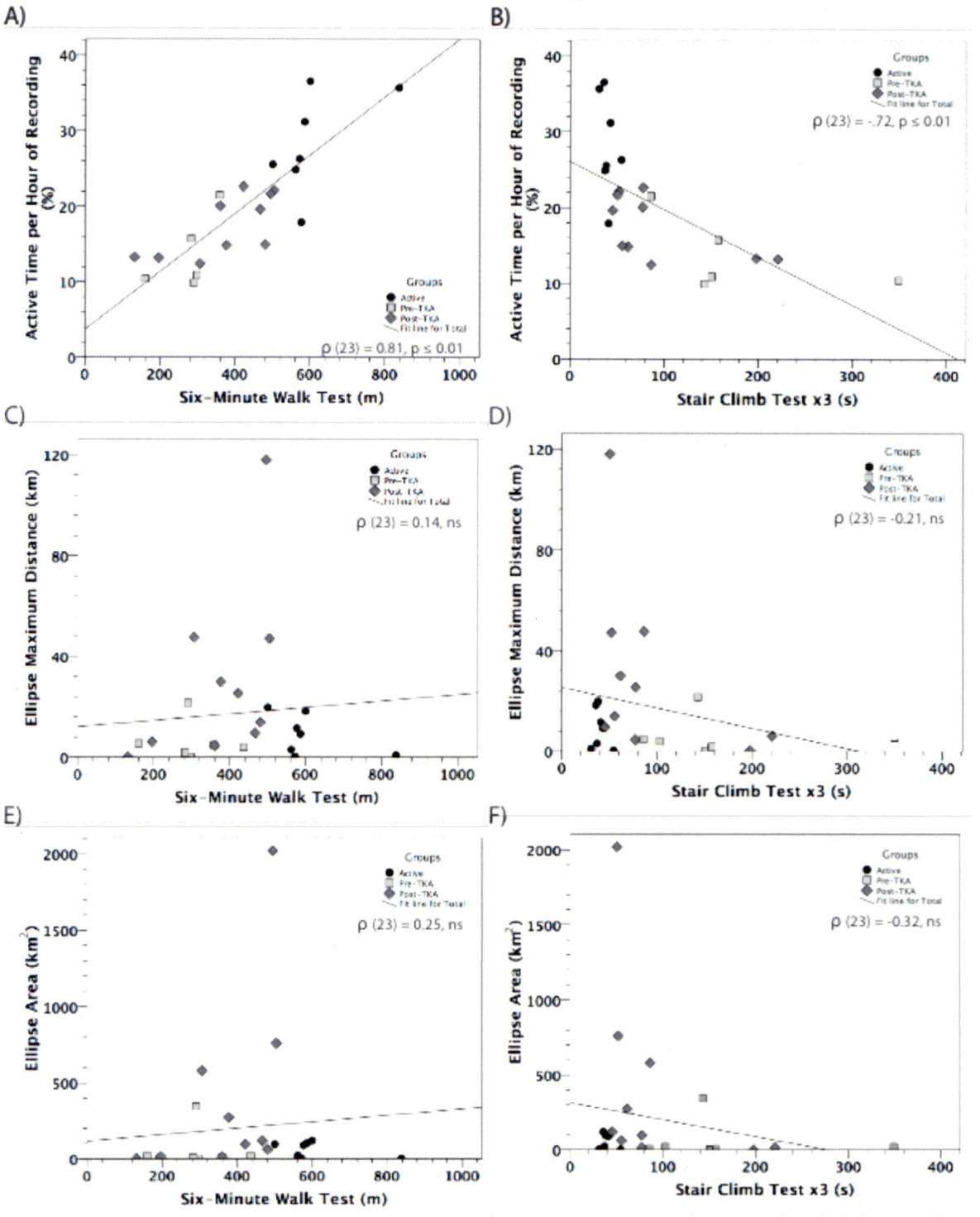


Scatterplot of Self-Reported vs Ecological Measures: A) Active Time Vs IPAQ; B) Active Time Vs Life-Space Questionnaire; C) Ellipse Maximum Distance Vs IPAQ; D) Ellipse Maximum Distance Vs Life-Space Questionnaire; E) Ellipse Area Vs IPAQ; and F) Ellipse Area Vs Life-Space Questionnaire

7.3.4 Performance-based *vs* Ecological (see figure 24)

Performance tests had moderate to strong significant correlations with both *active time* ($r_s \geq 0.57$, $p < 0.01$) and *time not at home active* ($r_s \geq 0.56$, $p < 0.01$). *Active time* had a stronger significant correlation with the six-minute walk ($r_s = 0.81$, $p < 0.01$) (Figure 23A) than any other performance-based measure. *Time not at home active* had its strongest significant correlations with both the six-minute walk test score ($r_s = 0.81$, $p < 0.01$) and the 8 ft. up and go test score ($r_s = -0.81$, $p < 0.01$). Once again, neither the ellipse area nor the ellipse distance were found to be significantly correlated with any variable (Figure 23).

Figure 23. Scatterplot of Performance-Based Vs Ecological Measures



Scatterplot of Performance-Based Vs Ecological Measures: A) Active Time Vs 6-Minute Walk Test; B) Active Time Vs Stair Climb Test (x3); C) Ellipse Maximum Distance Vs 6-Minute Walk Test; D) Ellipse Maximum Distance Vs. Stair Climb Test; E) Ellipse Area Vs 6-Minute Walk Test; and F) Ellipse Area Vs Stair Climb Test.

Table 11.
Spearman's Rho correlation matrix

X1 SF12 P	**X1**																						
X2 SF12 M	.32	**X2**																					
X3 KOOS P	.51	.51	**X3**																				
X4 KOOS S	.38	.5	**.92**	**X4**																			
X5 KOOS F	.54	.52	**.85**	**.84**	**X5**																		
X6 KOOS Q	.51	.52	**.86**	**.92**	**.83**	**X6**																	
X7 KOOS A	**.69**	**.67**	**.91**	**.86**	**.89**	**.83**	**X7**																
X8 QDSA	-.41	**-.66**	**-.95**	**-.93**	**-.88**	**-.88**	**-.9**	**X8**															
X9 IPAQ	**.65**	.37	.29	.37	.16	.49	.29	-.31	**X9**														
X10 LSA	.21	.19	.43	.46	.55	.41	.47	-.45	.18	**X10**													
X11 SPQ	.28	.19	.19	.19	.27	.17	.22	-.24	.1	.23	**X11**												
X12 6MWT	**.76**	.31	.57	.46	.38	.4	.57	-.51	**.6**	.25	.37	**X12**											
X13 U&G	**-.76**	-.4	-.53	-.41	.32	-.44	-.53	.44	**-.68**	-.19	-.25	**-.9**	**X13**										
X14 SCT	**-.75**	-.43	**-.73**	**-.68**	-.53	-.56	**-.73**	**.67**	**-.62**	-.26	-.33	**-.92**	**.88**	**X14**									
X15 CST	**.58**	**.55**	**.64**	**.63**	.5	.59	**.70**	**-.65**	**.6**	.13	.24	**.76**	**-.73**	**.88**	**X15**								
X16 QFF	**.57**	.2	.14	-.01	-.16	0.01	.11	-.12	**.51**	-.0	.28	**.75**	**-.75**	**-.73**	**-.56**	**X16**							
X17 QFP	.28	.13	-.33	-.38	-.56	-.51	-.34	.34	.34	-.04	.26	**.65**	**-.55**	**-.57**	**-.53**	**-.68**	**X17**						
X18 QFW	.41	.2	-.30	-.35	-.48	-.47	-.26	.32	.37	-.01	.3	**.73**	**-.58**	**-.68**	**-.64**	**-.69**	**-.94**	**X18**					
X19 Active	**.74**	.43	.32	.24	.28	.24	.46	-.3	**.54**	.18	.17	**.81**	**-.78**	**-.72**	**.68**	**.77**	**.57**	**.63**	**X19**				
X20 Distance	-0.22	.38	.49	.51	.34	.3	.42	-.55	-.03	.28	-.21	.14	-.02	-.21	.18	.10	.24	.23	.1	**X20**			
X21 Area	-.13	.34	.45	.47	.27	.24	.34	-.47	.02	.32	-.11	.25	.13	-.32	.24	.11	.24	.25	.02	**.94**	**X21**		
X22 At home	-.29	-.1	-.15	-.12	-.04	-.07	-.1	.08	-.43	-.17	.35	**-.55**	**.57**	.49	-.41	-.34	-.34	-.37	-.37	-.26	-.37	**X22**	
X23 Active in	.27	.17	-.20	-.28	.02	-.11	-.02	.17	-.13	-.29	.29	.04	.04	.0	.09	.08	.03	.12	.36	-.33	-.34	**.55**	**X23**
X24 Active out	**.55**	.3	.29	.28	.14	.24	.27	-.26	**.62**	.27	-.05	**.81**	**-.81**	**-.73**	**.67**	**.65**	**.56**	**.57**	**.76**	.16	.31	**-.84**	.20

Legend: **r** = $p < 0.01$ r = $p < 0.05$

Self-reported: X1 - X11; Performance-based: X12 - X18; and Ecological: X19 - X24.
From top to bottom: SF-12 physical; SF-12 mental; KOOS (pain; other symptoms; function, recreation and sports; quality of life; and activities of daily living); Questionnaire Douleur Saint-Antoine (pain questionnaire); Life-Space; Social Participation; 6-Minute Walk Test; 8 ft. Up and Go; Stair Climb Test (x3); 30 second Chair Stand Test; Quadriceps Femoris Force; Quadriceps Femoris Power; Quadriceps Femoris Work; % active; Max Distance; Area; % at Home; % Active in Home; % Active Not at Home.

8 DISCUSSION

As most studies depend solely on self-report measures, few have reported patient function and activity and mobility levels with the use of these three types of measures. The present pilot study project was limited by a small sample size. The objectives of this pilot study were to explore functional performance and the activity and mobility differences between a pre-TKA group and a post-TKA group, while comparing them to a healthy-active comparison group on a battery of measures that were self-reported, performance-based or ecological. This study acted as a pilot study for a larger, more rigorous one. Additionally, we explored these three types of measurements to see if there existed a relationship among them.

Results show that between the active and pre-TKA groups and active and post-TKA groups, the performance-based measures seemed to show more significant differences than self-reported and ecological. Between the pre-TKA and post-TKA groups, it was the self-reported measures, which detected most of the differences between the groups.

Even though we did not find a difference between the pre-TKA and post-TKA groups in terms of self-reported activity, we did find a difference in their ecological, *time not at home active*. Similarly, we did not see a difference between the active and pre-TKA groups on the life-space questionnaire, but we did see a difference on the ecological data, in *time spent at home*.

Performance-based measures had much better correlations with *active time* and *time not at home active* than did the self-report measures.

Interestingly, *time not at home active* had correlations with important variables across all types of measures. *Time not at home active* was correlated with the SF-12 physical and the IPAQ as well as all performance-based variables. More importantly, *time not at home active* was the only ecological variable that showed a difference among all three groups.

In the following sections we will explore these results more in detail. That is, first we will look at the differences between groups, then the relationships among the types of measures and finally, we will conclude this study and report recommendations and future research avenues.

It is important to note that the results be interpreted with caution since we will be comparing our results to longitudinal studies, which followed the same group from pre-TKA to post-TKA. Additionally, although we measured BMI, depression, cognitive function, co-morbidities, as well as medication, we did not have the statistical power to control for these variables. Therefore, they may have influenced the differences between groups.

8.1 Differences Across the Groups

8.1.1 Self-Reported

The active group was physically healthier and more active than the pre-TKA and post-TKA groups. This was to be expected as we purposely chose to have a healthy-active group to compare to our pre-TKA and post-TKA groups. Additionally, OA patients often report limiting their activities to avoid pain (de Groot, *et al.,* 2008) and

post-TKA patients may not have resumed their habitual activities. (Noble, et al., 2005) demonstrated with the help of the validated Total Knee Function Questionnaire that large differences exist between post-TKA patients and age- and gender-matched patients with no previous knee disorders.

Healthier levels of quality of life and pain are often reported following TKA (Wylde *et al.*, 2007). Therefore, according to how participants reported their own health, we found that our results coincided with those of the literature (Ethgen, Bruyere, Richy, Dardennes, & Reginster, 2004); Woolhead et al. 2005). That is to say, the post-TKA group had much better scores (healthier) on all the KOOS components and a lower score (less pain) than the pre-TKA group on the QDSA.

What is striking is the lack of difference between these groups on the life-space and social participation questionnaire since one would expect that an active individual would have the opportunity to participate more in the community and would have a larger life-space. This result could be due to low sample size, however, we suspect that it could also be due to the fact that the life-space questionnaire does not take into account the time spent in the zones (although it considers the frequency).

8.1.2 Performance-Based

The active group performed significantly much better than the pre-TKA and post-TKA groups on all performance-based tests. Again, this was expected and it is important to remember that we are not simply comparing the pre-TKA and post-TA groups with the general population but one that is considered active. Therefore, we cannot say how the pre-TKA and post-TKA would have performed compared to a

typical group with similar characteristics (age, sex, BMI, etc). We assume the lack of control on the age, sex and BMI variables could be the reason for QFP having high variability with the pre-TKA group and therefore only being different between the active and post-TKA group.

The only difference between the pre and post-TKA groups, regarding performance-based measures, was the stair climbing capacity. When looking at each group's median score, the pre-TKA group took about twice the amount of time to complete the stair climb test (x3). We expected to see greater differences in performance measures between these two groups, as it is often reported in longitudinal studies that patients perform better after TKA than they did before the surgery (I. de Groot, H. Bussmann, H. Stam, & J. Verhaar, 2008) & (Mizner, et al., 2010).

Unexpectedly, we did not see any differences between the pre-TKA and post-TKA groups on the 30-second chair stand test, 8-ft. up and go test and six-minute walk test. Our assumption is that the 30-second chair stand test and 8=ft. up and go test have too small of a scale, which doesn't allow us to see the important differences between the results. However, this cannot be the case for the insignificant differences on the six-minute walk test since it has a very large scale. Therefore, for the latter test, it is assumed that the lack of difference is caused by the variability, particularly with the post-TKA group. Contrary to the other performance tests, the stair climb test (x3) did not show much variability between groups, possibly because of the degree of difficulty in ascending and descending a flight of stairs three times, as opposed to walking on a flat surface for six minutes.

8.1.3 Ecological

Although the post-TKA group spent more time active not at home than the pre-TKA group, they did not necessarily spend more time active in total hours of recording than the pre-TKA group, nor did they even spend more time active, than the active group. Therefore the pre-TKA and post-TKA groups seem to be less active than the active group and perform whatever activities they do, inside their home rather than having to relocate or go outside compared to the active group. de Groot (2008) also found their hip and knee OA groups to be less active than non-OA control subjects with the help of a tri-axial accelerometer. We also found that the pre-TKA group spent more time at home than the active group. This difference was not found between the pre-TKA and post-TKA groups.

The post-TKA group is more active outside of their home than the pre-TKA group. This could be due to the fact that following OA, patients tend to give up certain activities and decide to do less demanding ones (de Groot, Bussmann, Stam, and Verhaar, 2008). However, after TKA, they begin to return to, or find new activities, which can be done outside of the home. Although a longitudinal study and no comparison group was involved, Walker *et al.* (2004), saw an increase in activity (with the help of an accelerometer) following TKA, just as we saw that the post-TKA group had a more active lifestyle, in terms of being more active not at home than the pre-TKA group.

8.2 Relationship Between Self-Reported, Performance-Based and Ecological Measures

Whereas most self-reported questionnaires seek to measure activity limitations experienced during daily activity, the performance-based measures ask the patients to perform at their best, which isn't necessarily the case in daily activities. More importantly, the performance-based measures do not reflect everyday activities or the regular environment of the subject. It is therefore interesting to analyse the relationship that these measures have amongst themselves.

8.2.1 Self-Reported *vs* Performance-Based

Good correlations were demonstrated between the self-reported and performance-based measures. It is particularly interesting that between the SF12 physical component, the KOOS pain component and KOOS activities of daily living component there were significant correlations with the four performance tests (excluding QFF, QFP and QFW). This could be explained by the fact that these correlations are the result of performance tests, which measure basic activities of daily living, as do most of the questions in these questionnaires. The IPAQ also had very good correlations with the same four performance tests. That is to say, between what the participants said they could do or how they said they felt, was significantly correlated with what they can do in a laboratory.

It is difficult to compare our results to other studies whic have not used the same measures or the same research design. Therefore, the results should be interpreted and compared to other studies with caution. Nonetheless, our results reveal stronger correlations between self-reported and performance-based results than what was

published by (Kennedy, Stratford, Pagura, Walsh, & Woodhouse, 2002) and (Gandhi, Tsvetkov, Davey, Syed, & Mahomed, 2009). Kennedy *et al.* (2002) found only low-to-moderate correlations between self-reported (Lower Extremity Activity Profile) and performance measures (fast self-paced walk test, stair climb test, and timed up and go) in pre-total hip arthroplasty and pre-TKA participants.

8.2.2 Self-Reported *vs* Ecological

Self-reported physical health was shown to have a very good correlations with *active time* and *time active not at home*, as did the IPAQ. This demonstrates that how participants say they feel physically and the amount of physical activity they say they do, both have a positive relationship with the amount of *active time* and time *active not at home* they accomplish.

Oddly enough, the life-space questionnaire had no correlation with the ellipse maximum distance or ellipse area, which represent the individual's life-space. Therefore, the life-space questionnaire does not correlate with our definition of life-space, possibly because it cannot consider the time spent in an area, as can the WIMuGPS. Additionally, the WIMuGPS was possibly too sensitive to extreme values and sampling time and therefore, a single long distance trip that is not typical of the individual's routine, could greatly bias the results.

While following a group of participants from pre-TKA to post-TKA, Walker *et al.* (2004) found there to be differences between the participants' self-reported mobility and accelerometer-based mobility, at all three data collection times (1 month pre-TKA, 3 and 6 months post-TKA). In this study, there was a moderate positive correlation

between participants' reported activity (IPAQ) and their accelerometer and GPS-based active time and time active not at home. Our results are similar to those of Mathie *et al.* (2004), who found a moderate correlation (r=-0.51) between their self-report measure of health (COOP/WONCA Health questionnaire) score and the tri-axial accelerometer's measure of energy exp. (signal magnitude area). Again, caution must be used when evaluating this comparison since not only are the instruments and measures used different but Mathie *et al.* (2004) had only one group of healthy individuals compared to our three groups of participants with different levels of health.

8.2.3 Performance-Based *vs* Ecological

Both *active time* and *time not at home active* had significant correlations with all performance measures. This leads us to believe that there is a positive relationship between an individual being active in general and active not at home, and his or her performance-based results.

8.3 Methodological Strengths and Weaknesses

Methodological strengths of this study include the fact that we included a comparison group. This group was not a so-called control group but rather a gold standard (i.e. a group of healthy individuals engaging in the recommended amount of physical activity by the American College of Sports Medicine). The fact that we separated our data collection into three meetings gave the participants an easier time to complete all the questionnaires and tests. It also allowed for us to comfortably fit two to

three participants in a day, as the meetings did not take more than one hour. Additionally, it allowed us to check on the ecological data and address any problems early. As the research assistant travelled for two out of the three meetings (for certain cases picked up the participant for the third meeting), it was easier for individuals to participate, especially those not having access to a vehicle. A key point to mention as well is the fact that this is a novel idea, of combining self-reported measure, performance-based measures and ecological measures, with an innovative device (WIMuGPS) which combined accelerometer and GPS. The device was created by the same group of experts who carried out the analysis of the raw data. The device was worn around the trunk, as has been suggested as the best position for full body acceleration (Choquette, Hamel, & Boissy, 2008). To be certain we captured the daily activities of the participants, we established a 500 minutes, or 8.3 hours, minimum recorded time per day for it to be considered a day. More over, this research project collected data for more hours in a day, for more days than any study, known to the research team.

This study suffered from a few methodological weaknesses. Firstly, environmental interference (weather and season) could have had an effect, since data collection was not done at precisely the same time (temporal effect) for all participants, therefore, the climate could affect each subject's active time differently. This in turn can have an effect on the study's reliability and variance. In terms of internal validity, subjects' history could have been an obstacle. Certain subjects will have been more active than others throughout their lives and whether they are in pain (or have different pain thresholds) or not, will be more active, as a lifestyle. Some may even have been submitted to other therapies or treatments that are unknown to the research team or seemed to be inconclusive for this research project. Attrition could also be an obstacle to

internal validity because of the studies three meetings. Experimental bias is likely to have had an effect on the results, as subjects may have tried to perform better merely because they were being observed (Hawthorne effect). The experimenter's passive and active behaviors may also have had an effect on the participants' execution during the performance tests. Additionally, variables capable of influencing the results such as ownership of a vehicle and valid driver's license were not taken into consideration in this study. This could have a large effect of the ecological variables, in particular.

8.4 LIMITATIONS

First and foremost, it is only with great caution that our data can be compared to other studies, as our study is unique regarding the data provided on actual daily activity. The main limitation is related to the heterogeneity of the data. That is to say some participants likely had different preoperative waiting times, different pain levels (individuals in more pain may not have wanted to participate).

Second, we did have difficulties with participant compliance. Some participants tampered with the accelerometer (WIMuGPS) controls, although they were instructed not to do so. Many forgot to charge the device at night, which led to no data the following day and sometimes longer. As well, some participants informed us that they decided to wear the device in their pocket or not at all for a day. Patients who are not active may have been discouraged by the many questions addressing challenging activities and may have been disinclined to participate. Additionally, the questionnaires relied on participants' abilities to accurately report their status and their frequency of participation in functional activities. We did not have any preoperative data to see how

the post-TKA group was before hand, as we do not have any follow up data on the pre-TKA group.

Thirdly, to distinguish between *active time* and *non active-in transit*, we set a threshold of 10 km/h indicating that the individual was in transit in a vehicle, rather than being active. This therefore could cause an error if an individual is, for example, cycling at 12 km/h for a certain time period and thus not considering such activities as active time.

The combination of GPS and accelerometer data can be challenging. Methodological issues such as low battery power, signal drop out, subject noncompliance or misuse of the device, can generate a loss of data. There are also monetary and time costs for elements, such as employing personnel to check the device.

9 RESEARCH AVENUES AND RECOMMENDATIONS

Future investigations should involve a mixed-methods approach, with a longitudinal design and a much larger sample size. Although this research project used three types of measures, it lacked qualitative measures. These measures could have given the participants a chance to express themselves. It is therefore possible that patients aren't necessarily looking to be more active but rather rid themselves of pain. They are possibly happy simply to get rid of the pain and know they can do more if they want to, without actually having to perform the activities.

It would also allow for a better comparison with other studies if the activity counts were converted into METs. However, there are many different algorithms used which do not necessarily look like in all studies leading to difficulty in comparing, once

again. Additionally, a longer sampling time (more days) should be considered for the ecological measures. Indeed one could argue, for the ecological data, what could be very helpful is the addition of an ellipse maximum distance radius, which includes the city only, thereby disregarding the unusual trip of an individual outside the city. In this case, it could be interesting to compare the travelled distance in the city *vs* outside the city. This could also highlight the outliers in the ecological data, that is, an ellipse that does not truly represent one's life-space.

10 CONCLUSION

The purpose of this study was to be descriptive rather than definitive. When comparing the active group with the pre and post-TKA groups on three different types of measures, the performance-based measures seemed to show more differences than self-reported and ecological. Between the pre-TKA and post-TKA groups, it was the self-report measures, which displayed most of the differences between groups.

In addition to the aforementioned aims, this study also aimed to assess the feasibility of combining self-reported and performance-based measures to accelerometer and GPS measures to gain a better understanding of individuals' activity and mobility levels. All measures clearly provided some important information. No type of measure should replace another. Rather, they should all be used together to bring about more complete analyses. Although methodologically challenging, this combination proved to be promising for future research of mobility and activity patterns in the healthy, the ill and the recently rehabilitated.

This research project has helped describe and identify residual deficits that remain after 12 months post TKA and their impact on functional performance, mobility and activities of subjects affected by gonarthrosis. As well, it enhanced the understanding of the relationship between the potential (self-reported), isolated (performance-based) and actual mobility and activity (ecological) capabilities of older adults. Lastly, this research project has provided information relevant to knee osteoarthritic patients to help promote more realistic expectations of TKA and a better prognostic.

This research project was able to find differences among groups, pinpoint the difficulties and limitations that arose during the course of the study and conceptualize solutions to these problems. These solutions can easily be integrated in the future protocol, for the larger study.

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Appendix 1. SF-12 Health Survey

L'information recueillie permettra vos docteurs de suivre comment vous vous sentez et si vous êtes capable de réaliser vos activités quotidiennes. Répondez à toutes les questions en plaçant un crochet sur la ligne devant la réponse la plus appropriée. Ce questionnaire n'est pas spécifique à l'arthrite. Si vous n'êtes pas certain de la façon de répondre à une question, répondez au mieux de vos connaissances et laissez une note à côté de votre réponse.

En général, diriez-vous que votre santé est:
____ Excellente (1)
____ Très bonne (2)
____ Bonne (3)
____ Passable (4)
____ Faible (5)

Les deux questions suivantes portent sur les activités que vous pourriez faire dans une journée normale. Est-ce que VOTRE SANTÉ VOUS LIMITE PRÉSENTEMENT dans la pratique de ces activités? Si oui, à quel niveau?

ACTIVITÉS MODÉRÉES, telles que bouger une table, passer votre aspirateur, aller jouer aux quilles ou jouer au golf:
____ Oui, très limité (1)
____ Oui, faiblement limité (2)
____ Non, Aucunement limité (3)

Monter PLUSIEURS escaliers:
____ Oui, très limité (1)
____ Oui, faiblement limité (2)
____ Non, Aucunement limité (3)

Lors des QUATRE DERNIÈRES SEMAINES, avez-vous rencontré l'un des problèmes suivants au travail ou lors de la pratique de vos activités quotidiennes à cause DE VOTRE SANTÉ PHYSIQUE?
Avez-vous ACCOMPLIE MOINS que vous l'auriez souhaité :
____ Oui (1)
____ Non (2)

Avez-vous été limité dans le TYPE de travail ou d'activités que vous avez accomplie:
___ Oui (1)
___ Non (2)

Lors des QUATRE DERNIÈRES SEMAINE, avez-vous rencontrez l'un des problèmes suivants au travail ou lors de la pratique de vos activités quotidiennes à cause DE PROBLÈMES ÉMOTIONNELS (tel que les sentiments d'anxiété ou de depression) ?
Avez-vous…
Avez-vous ACCOMPLIE MOINS que vous l'auriez souhaité?
____ Oui (1)
____ Non (2)

Avez-vous eu des difficultés à effectuer votre travail ou autres activités avec autant de soins qu'à l'habitude?
____ Oui (1)
____ Non (2)

Lors des QUATRE DERNIÈRES SEMAINES, est-ce que LA DOULEUR a interféré avec la pratique de vos activités quotidiennes (incluant le travail et les tâches ménagères)?
____ Aucunement (1)
____ Un peu (2)
____ Modéremment (3)
____ Beaucoup (4)
____ Extrêmement (5)

Les trois prochaines questions traitent de comment vous vous sentez et de comment les choses se sont passées au cours des QUATRE DERNIÈRE SEMAINES. Pour chaque question, indiquez la réponse la plus près de comment vous vous êtes sentis.

Lors des quatres dernières semaines…
Vous êtes-vous senti calme et en paix?
____ Tout le temps (1)
____ Presque tout le temps (2)
____ La majorité du temps (3)
____ Parfois (4)
____ Presque jamais (5)
____ Jamais (6)

Avez-vous eu beaucoup d'énergie?
____ Tout le temps (1)
____ Presque tout le temps (2)
____ La majorité du temps (3)
____ Parfois (4)
____ Presque jamais (5)
____ Jamais (6)

Vous êtes-vous senti abattu ou triste?
____ Tout le temps (1)
____ Presque tout le temps (2)

____ La majorité du temps (3)
____ Parfois (4)
____ Presque jamais (5)
____Jamais(6)

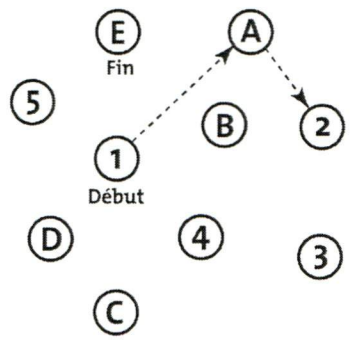
12. Lors des QUATRE DERNIÈRES SEMAINE, est-ce que votre SANTÉ PHYSIQUE ou DES PROBLÈMES ÉMOTIONNELS ont interférés avec vos activités sociales (visité des amis, famille, etc.)? Si oui, à quelle fréquence?

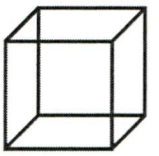
____ Tout le temps (1)
____ Presque tout le temps (2)
____ La majorité du temps (3)
____ Parfois (4)
____ Presque jamais (5)
___Jamais(6)

Appendix 2. Montreal Cognitive Assessment (MoCA)

MONTREAL COGNITIVE ASSESSMENT (MOCA) NOM :
Version 7.1 **FRANÇAIS** Scolarité : Date de naissance :
Sexe : DATE :

VISUOSPATIAL / ÉXÉCUTIF — POINTS





Copier le cube

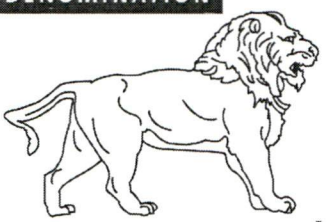
[ ] [ ]

Dessiner HORLOGE (11 h 10 min) (3 points)

[ ] Contour [ ] Chiffres [ ] Aiguilles

__/5

DÉNOMINATION



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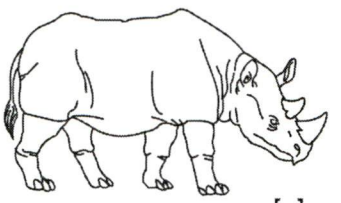

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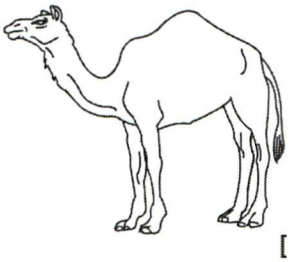

[ ]

__/3

MÉMOIRE Lire la liste de mots, le patient doit répéter. Faire 2 essais même si le 1er essai est réussi. Faire un rappel 5 min après.

	VISAGE	VELOURS	ÉGLISE	MARGUERITE	ROUGE
1er essai					
2ème essai					

Pas de point

ATTENTION Lire la série de chiffres (1 chiffre/ sec.). Le patient doit la répéter. [ ] 2 1 8 5 4
Le patient doit la répéter à l'envers. [ ] 7 4 2 __/2

Lire la série de lettres. Le patient doit taper de la main à chaque lettre A. Pas de point si 2 erreurs
[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B __/1

Soustraire série de 7 à partir de 100. [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65
4 ou 5 soustractions correctes : **3 pts**, 2 ou 3 correctes : **2 pts**, 1 correcte : **1 pt**, 0 correcte : **0 pt** __/3

LANGAGE Répéter : Le colibri a déposé ses œufs sur le sable . [ ] L'argument de l'avocat les a convaincus. [ ] __/2

Fluidité de langage. Nommer un maximum de mots commençant par la lettre «F» en 1 min [ ]____(N≥11 mots) __/1

ABSTRACTION Similitude entre ex : banane - orange = fruit [ ] train – bicyclette [ ] montre - règle __/2

RAPPEL

	Doit se souvenir des mots	VISAGE	VELOURS	ÉGLISE	MARGUERITE	ROUGE	Points pour rappel SANS INDICES seulement
	SANS INDICES	[ ]	[ ]	[ ]	[ ]	[ ]	
Optionnel	Indice de catégorie						
	Indice choix multiples						

__/5

ORIENTATION [ ] Date [ ] Mois [ ] Année [ ] Jour [ ] Endroit [ ] Ville __/6

© Z.Nasreddine MD www.mocatest.org Normal ≥ 26 / 30

TOTAL __/30
Ajouter 1 point si scolarité ≤ 12 ans

Administré par : _____

Appendix 3. Geriatric Depression Scale (GDS)

Nom : ..... Date : .....

Instructions : Encerclez la réponse exprimant le mieux comment vous vous sentiez au cours de la semaine passée.

1. Êtes-vous fondamentalement satisfait(e) de la vie que vous menez ? oui non
2. Avez-vous abandonne un grand nombre d'activités et d'intérêts ? oui non
3. Est-ce que vous sentez un vide dans votre vie ? oui non
4. Vous ennuyez-vous souvent ? oui non
5. Êtes-vous optimiste quand vous pensez à l'avenir ? oui non
6. Êtes-vous préoccupé(e) par des pensées dont vous n'arrivez pas a vous défaire ? oui non
7. Avez-vous la plupart du temps un bon moral ? oui non
8. Craignez-vous qu'il vous arrive quelque chose de grave ? oui non
9. Êtes-vous heureux/heureuse la plupart du temps ? oui non
10. Éprouvez-vous souvent un sentiment d'impuissance ? oui non
11. Vous arrive t-il souvent de ne pas tenir en place, de vous impatienter ? oui non
12. Préférez-vous rester chez vous au lieu de sortir pour faire de nouvelles activités ? oui non
13. Êtes-vous souvent inquiet(e) au sujet de l'avenir ? oui non
14. Avez-vous l'impression d'avoir plus de problèmes de mémoire que la majorité des gens ? oui non
15. Pensez-vous qu'il est merveilleux de vivre à l'époque actuelle ? oui non
16. Vous sentez-vous souvent triste et déprimé(e) ? oui non
17. Vous sentez-vous plutôt inutile dans votre état actuel ? oui non
18. Le passé vous préoccupe-t-il beaucoup ? oui non
19. Trouvez-vous la vie très excitante ? oui non
20. Avez-vous de la difficulté à entreprendre de nouveaux projets ? oui non
21. Vous sentez-vous plein(e) d'énergie ? oui non
22. Avez-vous l'impression que votre situation est désespérée ? oui non
23. Pensez-vous que la plupart des gens vivent mieux que vous ? oui non
24. Vous mettez-vous souvent en colère pour des riens ? oui non
25. Avez-vous souvent envie de pleurer ? oui non
26. Avez-vous de la difficulté à vous concentrer ? oui non
27. Êtes-vous heureux/heureuse de vous lever le matin ? oui non
28. Préférez-vous éviter les rencontres sociales ? oui non
29. Prenez-vous facilement des décisions ? oui non
30. Vos pensées sont-elles aussi claires que par le passe ? oui non

Appendix 4. Functional Comorbidity Index (FCI)

Avez-vous déjà présenté ou votre médecin vous a-t-il déjà mentionné que vous présentiez un ou plusieurs des affections ou diagnostics suivants? Veuillez placer un crochet (✓) dans la case appropriée.

		OUI	NON
1	Arthrite (rhumatoïde et/ou arthrose)		
2	Ostéoporose		
3	Asthme		
4	Maladie pulmonaire obstructive chronique (MPOC), syndrome de détresse respiratoire aigu (SDRA), ou emphysème.		
5	Angine (douleur thoracique reliée à votre coeur)		
6	Insuffisance cardiaque congestive (ou maladie cardiaque)		
7	Infarctus du myocarde		
8	Désordre neurologique (tel que sclérose en plaques ou parkinson)		
9	Accident vasculaire cérébral (AVC) ou ischémie cérébrale transitoire (ICT)		
10	Désordre vasculaire périphérique (ou claudication)		
11	Diabète		
12	Désordre gastro-intestinal (ulcère, hernie, reflux, brûlement sévère nécessitant de la médication)		
13	Dépression		
14	Anxiété ou épisodes de panique		
15	Trouble visuel (cataractes, glaucome, dégénérescence maculaire)		
16	Trouble auditif (difficulté importante à entendre malgré des prothèses auditives)		
17	Dégénérescence discale (sténose spinale, douleur chronique au dos)		
18	Obésité et/ou IMC de > 30kg/m^2		

Appendix 5. Life-Space Assessment Questionnaire (LSA)

Évaluation de l'aire de mobilité.
Version canadienne-française du Life-Space Assessment (LSA-F)

Directives LSA- F:

Les questions suivantes vont porter sur vos habitudes de déplacements dans différents environnements.

J'aimerais d'abord savoir si vous utilisez régulièrement une de ces aides techniques? (Cochez toutes celles qui s'appliquent)

- □Canne
- □Béquilles
- □Ambulateur
- □Marchette
- □Fauteuil roulant manuel
- □Fauteuil roulant motorisé
- □Triporteur, Quadriporteur
- □Fauteuil auto-souleveur/coussin auto-souleveur
- □Rampe d'accès
- □Orthèse
- □Prothèse
- □Barres d'appui (p. ex., dans la salle de bain, le bain ou la douche)
- □Siège de bain
- □Cabine de douche sans seuil
- □Chaise d'aisance ou siège de toilette surélevé
- □Lit d'hôpital
- □Bassine
- □Ventilateur
- □Oxygène/appareil d'assistance respiratoire (p. ex., inhalateur, pulvérisateur)
- □Autres

(procéder avec les questions du LSA-F à la suite)

Formulaire d'évaluation LSA-F

LES QUESTIONS SUIVANTES CONCERNENT SEULEMENT VOS ACTIVITÉS DU DERNIER MOIS. AU COURS DES QUATRE DERNIÈRES SEMAINES, ÊTES-VOUS ALLÉ ...			A. AU COURS DES QUATRE DERNIÈRES SEMAINES, COMBIEN DE FOIS ÊTES-VOUS ALLÉ...?				COMMENT VOUS Y ÊTES VOUS RENDU?					
							B. Avez-vous utilisé des aides techniques ou un équipement particulier pour vous rendre ...?			C. Avez-vous eu besoin de l'aide d'une personne pour vous rendre ...?		
	Oui	Non	Moins de 1 fois par semaine	1 à 3 fois par semaine	4 à 6 fois par semaine	Tous les jours	Oui	Non	Ne sait pas OU préfère ne pas répondre	Oui	Non	Ne sait pas OU préfère ne pas répondre
DANS DES PIÈCES DE VOTRE DOMICILE, AUTRES QUE CELLE OÙ VOUS DORMEZ? **AIRE DE MOBILITÉ 1***	O	O	O	O	O	O	O	O	O	O	O	O
	(LS1)		**(LS1F)**				**(LS1A)**			**(LS1H)**		
AUTOUR DE VOTRE DOMICILE, comme sur votre galerie, votre balcon, votre terrasse, dans les couloirs (immeuble d'habitation), dans le garage, sur votre terrain ou dans votre entrée de cour ? **AIRE DE MOBILITÉ 2**	O	O	O	O	O	O	O	O	O	O	O	O
	(LS2)		**(LS2F)**				**(LS2A)**			**(LS2H)**		
DANS VOTRE VOISINAGE, au-delà de votre cour ou de votre immeuble d'habitation? **AIRE DE MOBILITÉ 3**	O	O	O	O	O	O	O	O	O	O	O	O
	(LS3)		**(LS3F)**				**(LS3A)**			**(LS3H)**		
DANS VOTRE VILLE, au-delà de votre voisinage? **AIRE DE MOBILITÉ 4**	O	O	O	O	O	O	O	O	O	O	O	O
	(LS4)		**(LS4F)**				**(LS4A)**			**(LS4H)**		
À L'EXTÉRIEUR DE VOTRE VILLE? **AIRE DE MOBILITÉ 5**	O	O	O	O	O	O	O	O	O	O	O	O
	(LS5)		**(LS5F)**				**(LS5A)**			**(LS5H)**		

* LES PERSONNES QUI RÉPONDENT « NON » À L'AIRE DE VIE 1 SE VOIENT ATTRIBUER L'AIRE DE VIE 0. LES MOTS DOMICILE ET IMMEUBLE D'HABITATION SONT REMPLACÉS PAR « UNITÉ DE VIE » ET « RÉSIDENCE » POUR LES PERSONNES VIVANT EN CENTRE HÉBERGEMENT.

Appendix 6. International Physical Activity Questionnaire (IPAQ)

QUESTIONNAIRE SUR LES ACTIVITES PHYSIQUES DES 7 DERNIERS JOURS

Format Téléphonique Long 7 Derniers Jours

LIRE : Je vais vous interroger sur le temps que vous avez passé à être actif physiquement ces 7 derniers jours. Merci de répondre à chaque question même si vous ne vous considérez pas comme une personne physiquement active. Pensez aux activités que vous faites au travail, à domicile et dans votre jardin, pour vos déplacements d'un endroit à l'autre et pendant votre temps libre pour les loisirs, l'exercice ou le sport.

1ERE PARTIE : ACTIVITE PHYSIQUE LIEE AU TRAVAIL

LIRE : Les premières questions portent sur votre travail. Par travail on entend les emplois payés, le travail agricole, le travail bénévole, les études, les stages et tout autre type de travail non payé que vous avez effectué en dehors du domicile. Ne tenez pas compte du travail non payé que vous effectuez à domicile, comme faire le ménage, le jardinage, entretenir la maison ou vous occuper de votre famille. Je vous interrogerai sur ces activités plus tard.

Avez-vous actuellement un emploi ou faites-vous un travail payé ou non payé en dehors de votre domicile ? [Travail ; Oui = 1, Non = 0 ; 8,9]

____ Oui
____ Non *[Passez à la 2ème Partie]*
8. Ne sait pas / Pas sûr *[Passez à la 2ème Partie]*
9. N'a pas répondu

[Clarification de l'enquêteur : Cela comprend aussi les cours, les études et les stages. Cela comprend aussi le travail bénévole et le temps passé à chercher un emploi. Cela ne comprend pas le travail non payé fait à la maison ou dans votre jardin, ni le temps passé à s'occuper d'une personne à charge. Ceci fera l'objet de questions plus tard.]

LIRE : Les questions suivantes portent sur toutes les activités physiques que vous avez faites au travail qu'il soit payé ou non. Cela ne comprend pas les trajets entre votre domicile et votre travail.

LIRE : Tout d'abord, pensez aux activités *intenses* qui vous ont demandé un gros effort physique au travail. Les activités intenses font respirer beaucoup plus fort que d'habitude. Il peut s'agir d'activités comme porter des charges lourdes, creuser, faire de la maçonnerie ou monter des escaliers. Pensez seulement aux activités physiques intenses qui ont duré au moins dix minutes d'affilée.

Ces 7 derniers jours, pendant combien de jours avez-vous fait des activités physiques intenses au travail ? [De 0 à 7, 8, 9]

____ Jours par semaine *[Si la personne répond 0, passez à la question 4]*
Ne sait pas/pas sûr *[Passez à la question 4]*

N'a pas répondu *[Passez à la question 4]*

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Clarification de l'enquêteur : Le travail comprend le travail payé et non payé ainsi que les études et les stages. Tenez compte de tous les emplois et du travail bénévole.]

Quand vous avez fait des activités physiques intenses au travail au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ Minutes par jour [De 0 à 960, 998, 999]
Ne sait pas / Pas sûr
N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre ou bien parce qu'il y a une grande variété de travaux payés ou non, demandez : « Quelle a été la durée totale de vos activités physiques intenses au travail ces 7 derniers jours ? »

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas/pas sûr
9999. N'a pas répondu

LIRE : Maintenant pensez aux activités qui vous ont demandé un effort physique modéré au travail. Les activités physiques modérées font respirer un peu plus fort que d'habitude et peuvent comprendre des activités comme porter des charges légères. N'incluez pas la marche. Là encore, pensez seulement aux activités physiques modérées qui ont duré au moins 10 minutes d'affilé.

Ces 7 derniers jours, pendant combien de jours avez-vous fait des activités physiques modérées au travail ? [De 0 à 7, 8, 9]

____ Jours par semaine *[Si la personne répond 0, passez à la Question 6]*
Ne sait pas / pas sûr *[Passez à la question 6]*
N'a pas répondu *[Passez à la question 6]*

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Clarification de l'enquêteur : Le travail comprend le travail payé et non payé ainsi que les études et les stages. Tenez compte de tous les emplois et du travail bénévole.]

Quand vous avez fait des activités physiques modérées au travail au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
Ne sait pas / pas sûr
N'a pas répondu à la question

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre ou bien parce qu'il y a une grande variété de travaux payés ou non, demandez : « Quelle a été la durée totale de vos activités physiques modérées au travail ces 7 derniers jours ? »

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas/Pas sûr
9999. N'a pas répondu

LIRE : Maintenant, pensez au temps que vous passez à marcher pendant au moins 10 minutes au travail. Ne tenez pas compte de la marche entre votre domicile et votre lieu de travail.

Ces 7 derniers jours, pendant combien de jours avez-vous marché au travail ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne répond 0, passez à la 2ème partie]*
8. Ne sait pas/Pas sûr *[Passez à la 2ème partie]*
9. N'a pas répondu *[Passez à la 2ème partie]*

[Clarification de l'enquêteur : Pensez seulement à la marche qui a duré au moins 10 minutes d'affilée.]

[Clarification de l'enquêteur : Tenez compte de tous les types de travail.]

Quand vous avez marché au travail au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas/Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement à la marche qui a duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre ou bien parce qu'il y a une grande variété de travaux payés ou non, demandez : « Quelle a été la durée totale de votre marche au travail ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas/Pas sûr
9999. N'a pas répondu

2ème PARTIE : ACTIVITE PHYSIQUE LIEE AUX DEPLACEMENTS

LIRE : Maintenant, pensez à la manière dont vous vous êtes déplacé d'un endroit à un autre, notamment pour vous rendre au travail, dans des magasins, au cinéma, etc.

Ces 7 derniers jours, pendant combien de jours vous êtes-vous déplacé en véhicule motorisé comme le train, le bus, la voiture ou le tramway ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne interrogée répond 0, passez à la question 10]*
Ne sait pas / Pas sûr *[Passez à la question 10]*
N'a pas répondu *[Passez à la question 10]*

Quand vous vous êtes déplacé dans un véhicule à moteur (comme un train, un autobus, une voiture ou un tram) au cours d'un de ces jours, combien de temps cela a-t'il duré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas / Pas sûr
999. N'a pas répondu

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos déplacements en véhicule motorisé ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas / Pas sûr
9999. N'a pas répondu

LIRE : Maintenant, pensez à vos déplacements *à vélo* entre votre domicile et votre travail, pour faire des courses ou pour aller d'un endroit à un autre. Ne tenez compte que des trajets à vélo qui ont duré au moins 10 minutes d'affilée.

Ces 7 derniers jours, pendant combien de jours avez-vous fait du vélo pour aller d'un endroit à un autre ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne répond 0, passez à la question 12]*
Ne sait pas/Pas sûr *[Passez à la question 12]*
N'a pas répondu *[Passez à la question 12]*

[Clarification de l'enquêteur : Pensez à vos déplacements à vélo qui ont duré au moins 10 minutes d'affilée.]

Quand vous avez fait du vélo au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas/Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez à vos déplacements à vélo qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos déplacements à vélo pour aller d'un endroit à un autre ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas/Pas sûr
9999. N'a pas répondu

LIRE : Maintenant, pensez au temps que vous avez passé à *marcher* pour vous déplacer entre votre domicile et votre travail, pour faire des courses ou pour aller d'un endroit à un autre. Incluez seulement la marche qui a duré au moins 10 minutes d'affilée. Ne tenez pas compte de la marche de loisir qui n'avait pas pour but le déplacement d'un endroit à un autre.

Ces 7 derniers jours, pendant combien de jours vous êtes-vous déplacé à pied ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne répond 0, passez à la 3ème partie]*
Ne sait pas/Pas sûr *[Passez à la 3ème partie]*
9. N'a pas répondu *[Passez à la 3ème partie]*

[Clarification de l'enquêteur : Pensez seulement à la marche qui a duré au moins 10 minutes d'affilée.]

Quand vous avez marché pour vos déplacements au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas/Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement à la marche qui a duré au moins 10 minutes d'affilée.]
[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos déplacements à pied pour aller d'un endroit à un autre ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas/Pas sûr
9999. N'a pas répondu

3ème PARTIE : MENAGE, ENTRETIEN DE LA MAISON, TEMPS PASSE A S'OCCUPER DE SA FAMILLE

LIRE : Maintenant pensez aux activités physiques que vous avez faites ces 7 derniers jours à l'intérieur et à l'extérieur de votre domicile comme faire le ménage, le jardinage, faire des travaux d'entretien et vous occuper de votre famille.

LIRE : Pensez d'abord aux activités *intenses* qui demandent *un gros effort physique* et que vous avez faites dans votre jardin ou votre cour. Les activités intenses font respirer beaucoup plus fort que d'habitude et comprennent des activités comme soulever des charges lourdes, couper du bois, déblayer la neige ou bêcher. Encore une fois, pensez seulement aux activités physiques intenses qui ont duré au moins 10 minutes d'affilée.

Ces 7 derniers jours, pendant combien de jours avez-vous fait des activités physiques intenses dans votre jardin ou votre cour ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne répond 0, passez à la question 16.]*
Ne sait pas / pas sûr *[Passez à la question 16]*
N'a pas répondu *[Passez à la question 16]*

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

Quand vous avez fait des activités physiques intenses dans votre jardin ou votre cour au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas / pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos activités physiques intenses dans votre jardin ou votre cour ces 7 derniers jours ? »]
___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas / Pas sûr
9999. N'a pas répondu

LIRE : Maintenant pensez aux activités dans votre jardin ou votre cour qui vous ont demandé un effort physique *modéré*. Les activités physiques modérées font respirer un peu plus fort que d'habitude et comprennent des activités comme soulever des charges légères, balayer, nettoyer les vitres et ratisser. Encore une fois, ne tenez compte que des activités physiques modérées qui ont duré au moins 10 minutes d'affilée.

Ces 7 derniers jours, pendant combien de jours avez-vous fait des activités modérées dans votre jardin ou votre cour ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne interrogée répond 0, passez à la question 18]*
8. Ne sait pas / Pas sûr *[Passez à la question 18]*
9. N'a pas répondu *[Passez à la question 18]*

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée]

Quand vous avez fait de l'activité physique modérée dans votre jardin ou votre cour au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne?

___ ___Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas / Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos activités physiques modérées dans votre jardin ou votre cour ces 7 derniers jours ? »]
___ ___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ Minutes par semaine [De 0 à 960, 998, 999]
9998. Ne sait pas / Pas sûr
9999. N'a pas répondu

LIRE : Maintenant pensez aux activités *à l'intérieur de votre domicile* qui vous ont demandé au moins un effort physique *modéré*. Cela comprend des activités comme soulever des charges légères, nettoyer le sol ou les vitres et balayer. Ne tenez compte que des activités physiques modérées qui ont duré au moins 10 minutes d'affilée.

[Clarification de l'enquêteur : Les activités modérées font respirer un peu plus fort que d'habitude.]

Ces 7 derniers jours, pendant combien de jours avez-vous fait des activités modérées à l'intérieur de votre domicile ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne interrogée répond 0, passez à la 4ème partie]*
8. Ne sait pas / pas sûr *[Passez à la 4ème partie]*
9. N'a pas répondu *[Passez à la 4ème partie]*

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Clarification de l'enquêteur : Ces 7 derniers jours, combien de jours avez-vous fait des activités qui demandent au moins un effort modéré à l'intérieur de votre domicile ?]

Quand vous avez fait de l'activité physique modérée à l'intérieur votre maison au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas / Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos activités physiques modérées à l'intérieur de votre domicile ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas / Pas sûr
9999. N'a pas répondu

4ème PARTIE : ACTIVITE PHYSIQUE LIEE AUX LOISIRS, AU SPORT ET AU TEMPS LIBRE

LIRE : Maintenant, pensez à toutes les activités physiques que vous avez faites ces 7 derniers jours seulement dans le cadre de votre temps libre, de vos activités sportives ou de vos loisirs. Ne tenez pas compte des activités que vous avez déjà mentionnées.

Sans compter la marche que vous avez déjà mentionnée, ces 7 derniers jours, combien de jours avez-vous marché pendant au moins 10 minutes pendant votre temps libre ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne répond 0, passez à la question 22]*
8. Ne sait pas / pas sûr *[Passez à la question 22]*
9. N'a pas répondu *[Passez à la question 22]*

[Clarification de l'enquêteur : Pensez seulement à la marche qui a duré au moins 10 minutes d'affilée.]

Quand vous avez marché au cours de votre temps libre au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas/Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement à la marche qui a duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de votre marche pendant votre temps libre ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas / Pas sûr
9999. N'a pas répondu

LIRE : Maintenant, pensez aux autres activités physiques que vous avez faites pendant votre temps libre pendant au moins 10 minutes d'affilée.

LIRE : Tout d'abord, pensez aux activités *intenses* qui demandent un gros effort physique et que vous avez faites pendant votre temps libre. Il peut s'agir d'activités comme courir, faire du vélo ou nager vite ou faire de la gym type aérobic.

[Clarification de l'enquêteur : Les activités intenses font respirer plus fort que d'habitude.]

Ces 7 derniers jours, pendant combien de jours avez-vous fait des activités physiques intenses pendant votre temps libre ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la réponse est 0, passez à la question 24]*

8. Ne sait pas / pas sûr *[Passez à la question 24]*
9. N'a pas répondu *[Passez à la question 24]*

[Clarification de l'enquêteur : Pensez seulement aux activités physiques intenses qui ont duré au moins 10 minutes d'affilée.]

Quand vous avez fait des activités physiques intenses au cours de votre temps libre au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas / Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos activités physiques intenses pendant votre temps libre ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas / Pas sûr
9999. N'a pas répondu

LIRE : Maintenant, pensez aux activités qui demandent un effort physique *modéré* et que vous avez faites pendant votre temps libre. Il peut s'agir d'activités comme faire du vélo ou nager à un rythme tranquille ou jouer au tennis en double. Encore une fois, ne tenez compte que des activités modérées qui ont duré au moins 10 minutes d'affilée.

[Clarification de l'enquêteur : les activités physiques modérées font respirer un peu plus fort que d'habitude.]

Ces 7 derniers jours, pendant combien de jours avez-vous fait des activités physiques modérées pendant votre temps libre ? [De 0 à 7, 8, 9]

___ Jours par semaine *[Si la personne répond 0, passez à la 5ème partie]*
Ne sait pas / pas sûr *[Passez à la 5ème partie]*
N'a pas répondu *[Passez à la 5ème partie]*

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

Quand vous avez fait des activités physiques modérées pendant votre temps libre au cours d'un de ces jours, combien de temps y avez-vous consacré en moyenne ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas/Pas sûr

999. N'a pas répondu

[Clarification de l'enquêteur : Pensez seulement aux activités physiques de ce type qui ont duré au moins 10 minutes d'affilée.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Quelle a été la durée totale de vos activités physiques modérées pendant votre temps libre ces 7 derniers jours ? »]

___ ___ Heures par semaine [De 0 à 112]
___ ___ ___ ___ Minutes par semaine [De 0 à 6720, 9998, 9999]
9998. Ne sait pas/Pas sûr
9999. N'a pas répondu

5ème PARTIE : TEMPS PASSE ASSIS

LIRE : La dernière question porte sur le temps que vous avez passé *assis* ces 7 derniers jours. Incluez le temps passé au travail, à la maison, le temps passé à étudier ou en stage et le temps de loisirs. Cela peut comprendre le temps passé assis à votre bureau, assis lors d'une visite chez des amis, le temps passé à lire ou bien le temps passé assis ou allongé à regarder la télé. N'incluez pas le temps passé assis dans un véhicule motorisé que vous avez déjà mentionné.

En moyenne, ces 7 derniers jours, combien de temps avez-vous passé assis pendant un jour de semaine ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas/Pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Incluez le temps passé allongé sans dormir en plus du temps passé assis.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Au total, combien de temps avez-vous passé assis mercredi dernier ? »

___ ___ Heures le mercredi [De 0 à 16]
___ ___ ___ ___ Minutes le mercredi [De 0 à 960, 998, 999]
9998. Ne sait pas/Pas sûr
9999. N'a pas répondu

En moyenne, le week-end dernier, combien de temps avez-vous passé assis au cours d'une journée ?

___ ___ Heures par jour [De 0 à 16]
___ ___ ___ Minutes par jour [De 0 à 960, 998, 999]
998. Ne sait pas / pas sûr
999. N'a pas répondu

[Clarification de l'enquêteur : Incluez le temps passé allongé sans dormir en plus du temps passé assis.]

[Précision pour l'enquêteur : On recherche une durée moyenne par jour. Si la personne interrogée ne peut pas répondre parce que le temps consacré aux activités varie beaucoup d'un jour à l'autre, demandez : « Au total, combien de temps avez-vous passé assis samedi dernier ? »

___ ___ Heures le samedi [De 0 à 16]
___ ___ ___ ___ Minutes le samedi [De 0 à 960, 998, 999]
9998. Ne sait pas/Pas sûr
9999. N'a pas répondu

Appendix 7. Social Participation Questionnaire (SPQ)

Numéro du sujet (SUJETNO) : _____

PARTICIPATION SOCIALE (PARTSOCA)
Les questions qui suivent portent sur votre implication dans différentes activités (sociales ou de loisirs). Pourriez-vous répondre en utilisant les catégories de réponses suivantes: presque à tous les jours, au moins un fois par semaine, au moins une fois par mois, moins d'une fois par mois, jamais.

Au cours de la dernière année, à quelle fréquence avez-vous participé aux activités suivantes?

1. Rendu visite aux membres de votre famille ou à vos amis (PARTSOCA)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

2. Pratiqué un passe-temps à l'extérieur de la maison comme jouer aux cartes, au bridge ou au bingo, faire de la musique en groupe, chanter dans une chorale, etc. (PARTSOCB)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

3. Fréquenté un centre communautaire ou de loisirs (PARTSOCC)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

4. Fréquenté des magasins ou boutiques (PARTSOCD)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

5. Fréquenté des restaurants/bistrots/cafés (PARTSOCE)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

6. Assisté à un évènement sportif ou culturel (des pièces de théatre, des films, etc.) (PARTSOCF)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

7. Suivi un cours de peinture, de langue, d'internet, de tricot, etc. (PARTSOCG)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

8. Participé à un groupe d'échange ou d'entraide (PARTSOCH)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

9. Fréquenté une bibliothèque ou une maison de la culture (PARTSOCI)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois
Moins d'une fois par mois
Jamais

10. Fait du bénévolat au sein d'organismes communautaires, religieux, des écoles ou autres associations (PARTSOCJ)
Réponse:
Presque à tous les jours
Au moins une fois par semaine
Au moins une fois par mois

Moins d'une fois par mois
Jamais

Appendix 8. Knee injury and Osteoarthritis Outcome Score (KOOS)

QUESTIONNAIRE DE GENOU KOOS

DATE: _____ DATE DE NAISSANCE: _____

NOM: _____

INSTRUCTIONS

Ce questionnaire vous demande votre opinion sur votre genou. Il nous permettra de mieux connaître ce que vous ressentez et ce que vous êtes capable de faire dans votre activité de tous les jours.

Répondez à chaque question. Veuillez cocher une seule case par question. En cas de doute, cochez la case qui vous semble la plus adaptée à votre cas.

Symptomes

Ces questions concernent vos symptômes au cours des **huit derniers jours.**

S1. Est-ce que votre genou gonfle?

Jamais	Rarement	Parfois	Souvent	Tout le temps
☐	☐	☐	☐	☐

S2. Ressentez-vous des ou entendez-vous des craquements ou n'importe quel autre type de bruit en bougeant le genou?

Jamais	Rarement	Parfois	Souvent	Toujours
☐	☐	☐	☐	☐

S3. Est-ce que votre genou accroche ou se bloque en bougeant?

Jamais	Rarement	Parfois	Souvent	Toujours
☐	☐	☐	☐	☐

S4. Pouvez-vous étendre votre genou complètement?

Toujours	Souvent	Parfois	Rarement	Jamais
☐	☐	☐	☐	☐

S5. Pouvez-vous plier votre genou complètement?

Toujours	Souvent	Parfois	Rarement	Jamais
☐	☐	☐	☐	☐

Raideur

Ces questions concernent la raideur de votre genou au cours des **huit derniers jours**. La raideur est la sensation d'avoir du mal à bouger le genou.

S6. Le matin au réveil, la raideur de votre genou est:

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

S7. Après être resté(e) assis(e), couché(e), ou au repos pendant la journée, la raideur de votre genou est:

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

Douleur

P1. Avez-vous souvent mal au genou?

Jamais	Une fois par mois	Une fois par semaine	Tous les jours	Tout le temps
☐	☐	☐	☐	☐

Au cours des **huit derniers jours,** quelle a été l'importance de votre douleur du genou en faisant les activités suivantes?

P2. En tournant, pivotant sur votre jambe

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

P3. En étendant complètement le genou

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

P4. En pliant complètement le genou

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

P5. En marchant sur un terrain plat

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

P6. En montant ou en descendant les escaliers

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

P7. Au lit la nuit

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

P8. En restant assis(e) ou couché(e)

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

P9. En restant debout

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

Fonction, vie quotidienne

Les questions suivantes concernent ce que vous êtes capable de faire. Au cours des **huit derniers jours**, quelle a été votre difficulté pour chacune des activités suivantes?

A1. Descendre les escaliers

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A2. Monter les escaliers

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A3. Vous relever d'une position assise

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A4. Rester debout

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A5. Vous pencher en avant pour ramasser un objet

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A6. Marcher sur un terrain plat

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A7. Monter ou descendre de voiture

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A8. Faire vos courses

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A9. Mettre vos chaussettes ou vos collants

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A10. Sortir du lit

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A11. Enlever vos chaussettes ou vos collants

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A12. Vous retourner ou garder le genou dans la même position en étant couché(e)

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A13. Entrer ou sortir d'une baignoire

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A14. Rester assis(e)

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A15. Vous asseoir ou vous relever des toilettes

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A16. Faire de gros travaux ménagers (déplacer des objets lourds, récurer les sols,...)

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

A17. Faire des petits travaux ménagers (faire la cuisine, faire la poussière,...).

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

Activités, sport et loisirs

Les questions suivantes concernent ce que vous êtes capable de faire au cours d'autres activités. Au cours des **huit derniers jours**, quelle a été votre difficulté pour les activités suivantes?

SP1. Rester accroupi(e)

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

SP2. Courir

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

SP3. Sauter

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

SP4. Tourner, pivoter sur votre jambe

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

SP5. Rester à genoux

Absente	Légère	Modérée	Forte	Extrême
☐	☐	☐	☐	☐

Qualité de vie

Q1. Pensez-vous souvent à votre problème de genou?

Jamais	Une fois par mois	Une fois par semaine	Tous les jours	Tout le temps
☐	☐	☐	☐	☐

Q2. Avez-vous modifié votre façon de vivre pour éviter les activités qui pourraient aggraver votre problème de genou?

Pas du tout	Un peu	Modérément	Beaucoup	Totalement
☐	☐	☐	☐	☐

Q3. Est-ce qu'un manque de confiance dans votre genou vous gêne?

Pas du tout	Un peu	Modérément	Beaucoup	Totalement
☐	☐	☐	☐	☐

Q4. Finalement, êtes-vous gêné(e) par votre genou?

Pas du tout	Un peu	Modérément	Beaucoup	Extrêmement
☐	☐	☐	☐	☐

******Merci beaucoup d'avoir répondu à ce questionnaire******

Appendix 9. Questionnaire de Douleur Sainte-Antoine (QDSA)

Nom : Date :

Cotations 0 = absent 1 = faible 2 = modéré 3 = fort 4 = extrêmement fort

A	Battements	0	1	2	3	4
	Pulsations	0	1	2	3	4
	Elancements	0	1	2	3	4
	En éclairs	0	1	2	3	4
	Décharges électriques	0	1	2	3	4
	Coups de marteau	0	1	2	3	4
B	Rayonnante	0	1	2	3	4
	Irradiante	0	1	2	3	4
C	Piqûre	0	1	2	3	4
	Coupure	0	1	2	3	4
	Pénétrante	0	1	2	3	4
	Transperçante	0	1	2	3	4
	Coups de poignard	0	1	2	3	4
D	Pincement	0	1	2	3	4
	Serrement	0	1	2	3	4
	Compression	0	1	2	3	4
	Ecrasement	0	1	2	3	4
	En étau	0	1	2	3	4
	Broiement	0	1	2	3	4
	Tiraillement	0	1	2	3	4
	Etirement	0	1	2	3	4
E	Distension	0	1	2	3	4
	Déchirure	0	1	2	3	4
	Torsion	0	1	2	3	4

F	Arrachement	0	1	2	3	4
	Chaleur	0	1	2	3	4
	Brûlure	0	1	2	3	4
G	Froid	0	1	2	3	4
	Glace	0	1	2	3	4

Cotations 0 = absent 1 = faible 2 = modéré 3 = fort 4 = extrêmement fort

	Picotements		0	1	2	3	4
H							
	Fourmillement		0	1	2	3	4
	Démangeaisons		0	1	2	3	4
Engourdissement		0	1	2	3	4	
I							
	Lourdeur		0	1	2	3	4
	Sourde		0	1	2	3	4
	Fatigante		0	1	2	3	4
J							
	Epuisante		0	1	2	3	4
	Ereintante		0	1	2	3	4
	Nauséeuse		0	1	2	3	4
K							
	Suffocante		0	1	2	3	4
	Syncopale		0	1	2	3	4
	Inquiétante		0	1	2	3	4
L							
	Oppressante		0	1	2	3	4
	Angoissante		0	1	2	3	4
	Harcelante		0	1	2	3	4
	Obsédante		0	1	2	3	4
M							
	Cruelle		0	1	2	3	4
	Torturante		0	1	2	3	4
	Suppliciante		0	1	2	3	4
Gênante		0	1	2	3	4	
	Désagréable		0	1	2	3	4
N							
	Pénible		0	1	2	3	4
	Insupportable		0	1	2	3	4
	Enervante		0	1	2	3	4
O							
	Exaspérante		0	1	2	3	4
	Horripilante		0	1	2	3	4

P	Déprimante	0	1	2	3	4
	Suicidaire	0	1	2	3	4

Appendix 10. Centre de Recherche Étienne-Le Bel Ethics Approuval Documentation

Centre hospitalier universitaire de Sherbrooke
Centre de recherche clinique **Étienne-Le Bel**

CHUS Centre hospitalier universitaire de Sherbrooke

Avec vous, pour la Vie

Le 7 décembre 2011

Pr Patrick Boissy
Centre de recherche sur le vieillissement

OBJET: Projet # 11-147
Fonction, mobilité, activité et satisfaction suite à une arthroplastie totale du genou chez des sujets gonarthrosiques: une étude pilote à devis mixte.

Pr Boissy ,

Nous aimerions, par la présente, vous aviser que votre protocole de recherche cité en rubrique a été approuvé par le Comité d'éthique de la recherche en santé chez l'humain du CHUS.

Les conditions requises à la réalisation de ce projet de recherche étant réunies, il nous fait plaisir de vous autoriser à débuter l'étude.

Vous souhaitant tout le succès escompté dans le déroulement de cette étude, je vous prie de croire à l'expression de mes sentiments les plus distingués.

Serge Marchand, Ph.D.
Directeur scientifique
Centre de recherche clinique Étienne-Le Bel

/hl

cc: Dr François Cabana

CENTRE DE RECHERCHE CLINIQUE ÉTIENNE-LE BEL DU CHUS
Hôpital Fleurimont, aile 8, porte 4, pièce 2873
Téléphone : 819 820-6480 • 819 346-1110 poste 12873 • Télécopieur : 819 564-5445
crcinformation.chus@ssss.gouv.qc.ca

www.crc.chus.qc.ca

APPROBATION
Comité d'éthique de la recherche en santé chez l'humain du
Centre hospitalier universitaire de Sherbrooke

MEMBRES DU COMITÉ :

BERNIER, Louise, LL.D. juriste, professeure, UdeS
BOUFFARD, Nicole, infirmière, rep. scientifique, v.-présidente
BRISSON, Sophie, LL.M. avocate, extérieur
BRODEUR, Louise, B.F.A. représentante du public
CHAÂLALA, Chiraz, M.D. neurochirurgie, CHUS
CISSÉ, Aboubacar, D.Sc. professeur, FMSS
CLICHE, Jocelyne, LL.M. représentante du public / droit
CLOUTIER, Sylvie, M.Sc. pharmacienne, CHUS
CLOUTIER, Yvan, Ph.D. représentant en éthique, extérieur
CÔTÉ, Anne-Marie, M.D. néphrologie, CHUS
CUMYN, Annabelle, M.D. interniste, CHUS
CYR, Claude, M.D. pédiatrie, CHUS
DESPATIS, Marc-Antoine, M.D. chirurgie vasculaire, CHUS
GRÉGOIRE, Nathalie, LL.M. avocate, extérieur
JETTÉ, Sylvie, D. Sc. infirmière, professeure, FMSS
LEBLOND, Julie, M. Sc. pharmacienne, CHUS
MÉNARD, Julie, D. Sc. représentante scientifique, CRC
MONETTE, Marcelle, Ph..D. rep. éthique / scientifique, Présidente
NAUD, Marie-George, C.Ps. représentante du public
POIRIER, Marie-Sol, M.Sc (c), rep. éthique / scientifique
ROBERGE, Jean-Pierre, B.E.,représentant du public
ROUSSEAU, Marie-Pierre, M. Sc. pharmacienne, CHUS
SAVARD, Anne-Marie, LL.D. avocate, professeure, UdeS
VIGNEAULT, Raymonde, représentante du public

En raison de son implication dans le projet de recherche, la personne suivante, membre du comité d'éthique, n'a pas participé à son évaluation ou à son approbation : S/O

Approbation demandée par: Pr Patrick Boissy

Pour le projet # 11-147-M1
Fonction, mobilité, activité et satisfaction suite à une arthroplastie totale du genou chez des sujets gonarthrosiques: une étude pilote à devis mixte.

Approbation donnée par la présidence le 28 mars 2012

☒ Protocole complet : version 20 février 2012
☐ formulaire de consentement principal :
☐ Autre formulaire de consentement :
☐ Questionnaire(s) :
☒ Amendement # : #1 Date amendement : 20 février 2012
☒ Autre : Autorisation à être contacté (formulaire clinique x2) version 27 mars 2012

En ce qui concerne l'essai clinique visé, à titre de représentant du Comité d'éthique de la recherche, je certifie que:
1. La composition de ce comité d'éthique satisfait aux exigences pertinentes prévues dans le titre 5 de la partie C du Règlement sur les aliments et drogues.
2. Le comité d'éthique de la recherche exerce ses activités de manière conforme aux bonnes pratiques cliniques, et
3. Ce comité d'éthique a examiné et approuvé le formulaire de consentement et le protocole d'essai clinique qui sera mené par le chercheur susmentionné, au lieu d'essai indiqué. L'approbation et les opinions du présent comité ont été consignées par écrit.

Signé par: Marcelle Monette
Marcelle Monette, Ph.D.
Présidente du comité

28 mars 2012
Date de signature

CHUS
Centre hospitalier universitaire de Sherbrooke

COMITÉ D'ÉTHIQUE DE LA RECHERCHE EN SANTÉ CHEZ L'HUMAIN

Le 25 novembre 2011

Pr Patrick Boissy
Centre de recherche sur le vieillissement

OBJET: Projet # **11-147**
Fonction, mobilité, activité et satisfaction suite à une arthroplastie totale du genou chez des sujets gonarthrosiques: une étude pilote à devis mixte.

Pr Boissy ,

Le Comité d'éthique de la recherche en santé chez l'humain du Centre Hospitalier Universitaire de Sherbrooke a évalué le protocole de recherche ainsi que les documents afférents à l'étude citée en objet de la lettre. La présente est pour vous informer que le CÉR a approuvé votre projet. À cet effet, veuillez trouver ci-joint le formulaire d'approbation.

Veuillez également trouver ci-joint, s'il y a lieu, le formulaire de consentement approuvé par le CÉR et portant le sceau d'approbation. Vous devez utiliser des photocopies de ce formulaire pour obtenir le consentement des sujets.

Nous avons avisé le directeur scientifique du Centre de recherche clinique Étienne-Le Bel de l'approbation de votre projet. Vous devez attendre son autorisation avant de le débuter.

Espérant le tout à votre convenance, je vous prie d'agréer mes sentiments distingués.

Marie-Josée April, Ph. D.
Vice-présidente du comité

Téléphone: 819 346-1110, poste 12856
Télécopieur: 819 820-6498
Courrier électronique: ethique.chus@ssss.gouv.qc.ca
Site WEB: www.crc.chus.qc.ca

HÔPITAL FLEURIMONT
3001, 12è Avenue Nord
Bureau Z5-3014
Sherbrooke (Québec) J1H 5N4

APPROBATION ET ATTESTATION

Comité d'éthique de la recherche en santé chez l'humain du Centre hospitalier universitaire de Sherbrooke

MEMBRES DU COMITÉ :

APRIL Marie-Josée, Ph.D. rep. éthique, FMSS, v.-présidente
BERNIER, Louise, LL.D. juriste, professeure, UdeS
BOUFFARD, Nicole, infirmière, rep. scientifique, v.-présidente
BRISSON, Sophie, LL.M. avocate, extérieur
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CÔTÉ, Anne-Marie, M.D. néphrologie, CHUS
CYR, Claude, M.D. pédiatrie, CHUS
DESPATIS, Marc-Antoine, M.D. chirurgie vasculaire, CHUS
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JETTÉ, Sylvie, D. Sc. infirmière, professeure, FMSS
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ROBERGE, Jean-Pierre, B.É. représentant du public
ROUSSEAU, Marie-Pierre, M. Sc. pharmacienne, CHUS
SAVARD, Anne-Marie, LL.D. avocate, professeure, UdeS
VIGNEAULT, Raymonde, représentante du public

En raison de son implication dans le projet de recherche, la personne suivante, membre du comité d'éthique, n'a pas participé à son évaluation ou à son approbation : S/O

Approbation demandée par: Pr Patrick Boissy
Pour le projet # 11-147 Dr François Cabana

Fonction, mobilité, activité et satisfaction suite à une arthroplastie totale du genou chez des sujets gonarthrosiques: une étude pilote à devis mixte.

Approbation donnée par la vice-présidence le 25 novembre 2011 pour 12 mois.

☒ Protocole complet : du 22 novembre 2011

☒ Formulaire de consentement principal 22 novembre 2011 v. 1.2 fr

☐ Autre formulaire de consentement :

☐ Questionnaire(s) :

☐ Amendement # : . Date amendement :

☒ Autre : Feuillets explicatifs v.1.1 septembre 2011 groupe expérimental et v.1.1 novembre 2011 groupe contrôle; Affiches de recrutement groupe expérimental / groupe contrôle; Lettre de recrutement; Texte de présentation pour recrutement téléphonique par les archives : v. fr

Brochure /Monographie reçue pour évaluation:

En ce qui concerne l'essai clinique visé, à titre de représentant du Comité d'éthique de la recherche, je certifie que:
1. La composition de ce comité d'éthique satisfait aux exigences pertinentes prévues dans le titre 5 de la partie C du Règlement sur les aliments et drogues.
2. Le comité d'éthique de la recherche exerce ses activités de manière conforme aux bonnes pratiques cliniques, et
3. Ce comité d'éthique a examiné et approuvé le formulaire de consentement et le protocole d'essai clinique qui sera mené par le chercheur susmentionné, au lieu d'essai indiqué. L'approbation et les opinions du présent comité ont été consignées par écrit.

Signé par: **Marie-Josée April, Ph. D.**
Vice-présidente du comité

25 novembre 2011
Date de la signature

Appendix 11. Centre de Recherche Clinique Étienne-Le Bel Information and Consent Form (pre-TKA and post-TKA Group)

CHUS Centre hospitalier universitaire de Sherbrooke
Centre de recherche clinique Étienne-Le Bel

CENTRE HOSPITALIER UNIVERSITAIRE DE SHERBROOKE
Hôpital Fleurimont, 3001, 12e Avenue Nord, Fleurimont (Québec) J1H 5N4
Hôtel-Dieu, 580, rue Bowen Sud, Sherbrooke (Québec) J1G 2E8
Téléphone : (819) 346-1110

FORMULAIRE D'INFORMATION ET DE CONSENTEMENT

TITRE DU PROJET DE RECHERCHE
Fonction, mobilité, activité et satisfaction suite à une arthroplastie totale du genou chez des sujets gonarthrosiques: une étude pilote d'analyse des résultats 6 à 18 mois post-opératoire.

CHERCHEURS RESPONSABLES DU PROJET
Patrick Boissy, PhD, Professeur agrégé
Département de chirurgie, FMSS
Chercheur, Centre de recherche sur le vieillissement, CSSS-IUGS.

François Cabana, M.D., Professeur titulaire
Département de chirurgie, FMSS
Chercheur, Centre de recherche sur le vieillissement, CSSS-IUGS.

Cédric Gingras-Hill, B.Sc.S Spécialisé, Mineure en gérontologie
Étudiant à la maîtrise en gérontologie
Université de Sherbrooke
À contacter: 819-571-4636

FINANCEMENT DU PROJET
Les chercheurs responsables de ce projet ont les fonds nécessaires pour la réalisation de cette étude.

PRÉAMBULE
Nous sollicitons votre participation à un projet de recherche. Cependant, avant d'accepter de participer à ce projet et de signer ce formulaire d'information et de consentement, veuillez prendre le temps de lire, de comprendre et de considérer attentivement les renseignements qui suivent. Ce formulaire peut contenir des mots que vous ne comprenez pas. Nous vous invitons à poser toutes les questions que vous jugerez utiles à l'équipe de recherche et à leur demander de vous expliquer tout mots ou renseignement qui n'est pas clair.

NATURE ET OBJECTIFS DU PROJET DE RECHERCHE
La gonarthrose (arthrose aux genoux) touche un grand nombre de personnes. Parmi les modalités de traitements possibles de la gonarthrose, on retrouve traditionnellement la prise de médicaments, la physiothérapie, les exercices et les changements d'habitudes de vie, les injections articulaires et finalement la chirurgie. Ce projet de recherche s'intéresse aux effets de la chirurgie, plus précisément, à l'arthroplastie totale du genou (ou remplacement total du genou, ou prothèse totale du genou), dans le traitement de la gonarthrose. Nous savons que l'arthroplastie totale du genou amène une réduction significative de la douleur,

CÉR chez l'humain du CHUS
APPROUVÉ 25 novembre 2011

mais on connaît peu ses impacts sur les activités de la vie quotidienne des gens après la chirurgie. Nous sommes donc intéressés à en connaître un peu plus sur l'effet de cette chirurgie au niveau des profils de mobilité et d'activité des gens entre 6 à 18 mois après la chirurgie.

Pour ce faire, nous cherchons à comparer le niveau de mobilité et d'activité entre un groupe de participants en attente pour un remplacement total du genou (groupe expérimental) à un groupe de participants ayant reçu un remplacement totale du genou (groupe expérimental) et à un groupe témoin avec les mêmes caractéristiques (groupe contrôle).

Nous aimerions recruter 60 participants (20 dans chacun des groupes). Les participants doivent être âgés entre 55 et 75 ans.

Le but de cette recherche est d'explorer l'impact du remplacement total du genou sur la mobilité, la douleur et le retour aux activités régulières à la suite de la chirurgie.

DÉROULEMENT DU PROJET DE RECHERCHE

Votre participation à ce projet de recherche implique trois rencontres, d'environ une heure et demi chacune.

Première rencontre

Lors de la première rencontre, un assistant de recherche se rendra, sur rendez-vous, selon vos disponibilités, à votre domicile pour une entrevue, vous faire compléter une série de questionnaires et pour vous expliquer le fonctionnement de l'appareil que vous devrez porter pour 14 heures consécutives, pendant 14 jours consécutifs. L'entrevue ne sera faite qu'auprès des participants ayant eu une arthroplastie totale du genou (groupe expérimental). Les thèmes abordés lors de l'entrevue porteront sur la satisfaction envers les résultats de l'opération et les symptômes ou difficultés fonctionnelles résiduelles. L'appareil, nommé le WIMuGPS, mesure 4,5 cm de largeur par 7,2 cm de longueur et a une épaisseur de 1,6 cm. Le WIMuGPS permettra de mesurer votre niveau d'activité et d'espace de vie. Cette visite durera environ une heure.

Les quatre questionnaires de cette rencontre nous informeront sur des variables de contrôle pour l'étude. Ces dernières sont: 1) la santé cognitive; 2) les symptômes dépressifs; 3) le taux de comorbidités; et 4) le statut fonctionnel. Le questionnaire portant sur le statut fonctionnel sera complété par les deux groupes mais déterminera l'admissibilité des sujets dans le groupe contrôle seulement. Cette rencontre servira aussi comme séance d'enseignement pour vous expliquer le fonctionnement du dispositif que vous porterez (comment le porter, où le brancher, etc.). Ce dispositif est similaire à un podomètre et servira à mesurer l'orientation de votre corps dans l'espace (si vous êtes couché, assis, debout ou en mouvement) et permettra aussi de calculer les distances que vous parcourrez par rapport à votre domicile. Nous saurons, aussi, si les déplacements sont faits à pied ou par un autre moyen de transport (par exemple en voiture). Même si la composante GPS du dispositif nous permet de localiser des endroits spécifiques que vous visitez, nous ne nous intéressons pas à examiner les endroits visités, mais plutôt, les distances parcourues à partir de votre domicile.

Deuxième rencontre
Sept jours plus tard, l'assistant de recherche reviendra, sur rendez-vous et selon vos disponibilités, à votre domicile pour compléter une deuxième série de questionnaires, vérifier le fonctionnement de l'appareil et répondre à vos questions. Les questionnaires seront centrés sur le niveau d'activité, l'espace de vie et la participation sociale. Cette visite durera environ une heure.

Troisième rencontre
La dernière rencontre aura lieu sept jours après la deuxième rencontre, au Centre de recherche sur le vieillissement (CDRV) pour des mesures de vos capacités. Vous serez soumis à un examen de la force des muscles de vos jambes grâce à un appareil de dynamométrie, la mesure d'amplitude de mouvement de votre genou, deux tests d'équilibre et mobilité, un test de force musculaire des jambes, un test de contrôle postural (effectué sur la jambe opérée et la jambe non opérée), un test de vitesse de marche, un test de marche normale de six minutes et finalement, un test de capacité escalatrice. La circonférence de vos hanches et votre taille sera prise avec un ruban à mesurer et votre bio impédance (composition corporelle) sera prise. De plus, votre force de préhension des mains sera évaluée à l'aide d'un dynamomètre.

L'appareil sera remis à la fin de la rencontre qui durera environ deux heures. Vous ne serez pas tenu responsable s'il arrive un bris à l'équipement.

RISQUES ASSOCIÉS AU PROJET DE RECHERCHE

Il est possible que vous ressentiez des douleurs musculaires ou articulaires à la suite des tests cliniques, surtout si vous n'avez pas l'habitude d'en faire. Ces inconforts devraient être passagers. Bien que nous prenions des précautions tels qu'un réchauffement, une supervision et un enseignement minutieux des tests, il existe une possibilité de vous blesser pendant la réalisation d'un de ces tests. Par exemple, un gonflement articulaire du genou ou une douleur tendineuse. Il existe, aussi, une possibilité de risques inattendus ou imprévisibles.

INCONVÉNIENTS

Vous devrez vous déplacer au CDRV.
Vous devrez consacrer du temps à faire les différents tests et remplir les questionnaires.
Vous aurez à porter un appareil au tronc à journée longue (14 heures consécutives), pendant 14 jours.
L'appareil au tronc nécessitera d'être rechargé chaque nuit.

AVANTAGES

Il se peut que vous retiriez un bénéfice personnel de votre participation à ce projet de recherche, mais on ne peut vous l'assurer. Par ailleurs, les résultats obtenus contribueront à l'avancement des connaissances dans ce domaine.

PARTICIPATION VOLONTAIRE ET POSSIBILITÉ DE RETRAIT

Votre participation à ce projet de recherche est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de ce projet à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision à l'équipe de recherche. Le chercheur peut retirer le participant à n'importe quel moment.

Si vous vous retirez ou si vous êtes retiré du projet, l'information déjà obtenue dans le cadre de ce projet sera conservée selon les modalités décrites à la rubrique Confidentialité.

Toute nouvelle connaissance acquise durant le déroulement du projet qui pourrait affecter votre décision de continuer d'y participer vous sera communiquée sans délai, verbalement et par écrit.

CONFIDENTIALITÉ

Durant votre participation à ce projet, les chercheurs responsables et l'équipe de recherche recueilleront et consigneront dans un dossier de recherche des renseignements qui vous concernent. Seuls ceux qui sont strictement nécessaires pour répondre aux objectifs scientifiques du projet seront recueillis et utilisés à des fins de recherche.

Ces renseignements (données) comprendront les informations suivantes :

- Votre nom, votre adresse, votre sexe et votre date de naissance
- Vos habitudes de vie
- Les résultats de tous les tests, examens et procédures que vous aurez à faire durant ce projet

Toutes ces données demeureront strictement confidentielles, dans les limites prévues par la loi. Afin de préserver votre identité et la confidentialité des renseignements recueillis, vous serez identifié par un numéro de code. La clé du code reliant votre nom à votre dossier de recherche sera conservée exclusivement par les chercheurs responsables.

À la fin du projet de recherche, les données informatiques seront anonymisées, c'est-à-dire qu'il sera impossible de lier les données à votre nom, prénom, coordonnées ou date de naissance. La clé de code aura été détruite. Ainsi, les données de recherche pourront :

- Être publiées dans des revues spécialisées
- Faire l'objet de discussions scientifiques
- Servir pour d'autres analyses reliées au projet
- Servir pour l'élaboration de projets de recherche futurs.

Concernant votre dossier de recherche (documents papier), ce dernier sera détruit à l'exception de vos renseignements personnels (votre nom et vos coordonnées) qui seront conservés durant 5 ans après la fin du projet et détruits par la suite selon les normes en vigueur au CSSS-IUGS.

Initiales du participant : _____

Les personnes suivantes pourront consulter votre dossier de recherche :

- Vous-même, pour vérifier les renseignements recueillis et les faire rectifier au besoin et ce, aussi longtemps que le chercheur responsable ou le CSSS-IUGS détiennent ces informations.
- Une personne mandatée par le Comité d'éthique de la recherche du CSSS-IUGS ou par des organismes publics autorisés et ce, à des fins de surveillance et de contrôle. Toutes ces personnes et organismes adhèrent toutes à une politique de confidentialité.

INDEMNISATION EN CAS DE PRÉJUDICE ET DROITS DU SUJET DE RECHERCHE

Si vous deviez subir quelque préjudice que ce soit dû à votre participation au projet de recherche, vous recevrez tous les soins et services requis par votre état de santé, sans frais de votre part. Le Centre de recherche sur le vieillissement possède une assurance responsabilité civile et professionnelle pour ses intervenants.

En acceptant de participer à ce projet, vous ne renoncez à aucun de vos droits, ni ne libérez les chercheurs ou le CSSS-IUGS de leur responsabilité civile et professionnelle.

COMPENSATION

Vous recevrez une somme forfaitaire de 45 dollars en compensation des frais encourus et des contraintes subies. Cette somme vous sera versée à la fin de l'étude. Si vous vous retirez ou si vous êtes retiré du projet avant qu'il ne soit complété, vous recevrez un montant proportionnel à votre participation.

IDENTIFICATION DES PERSONNES RESSOURCES

Si vous avez des questions concernant le projet de recherche ou si vous éprouvez un problème que vous croyez relié à votre participation au projet de recherche, vous pouvez communiquer avec les chercheurs responsables du projet de recherche au numéro suivant : Patrick Boissy : (819) 780-2220 poste 45628 et Cédric Gingras-Hill : (819) 571-4636.

Pour toute question concernant vos droits en tant que sujet participant à ce projet de recherche ou si vous avez des plaintes ou des commentaires à formuler, vous pouvez communiquer avec le Commissaire local aux plaintes et à la qualité des services au numéro suivant : (819) 780-2220, poste 40204.

SURVEILLANCE DES ASPECTS ÉTHIQUES DU PROJET DE RECHERCHE

Le Comité d'éthique de la recherche du CSSS-IUGS a approuvé ce projet de recherche et en assure le suivi annuel. De plus, il approuvera au préalable toute révision et toute modification apportées au formulaire d'information et de consentement et au protocole de recherche.

Le Comité d'Éthique de la recherche du CHUS a également approuvé ce projet de recherche et en assure le suivi. Si vous désirez rejoindre l'un des membres de ce comité vous pouvez communiquer avec le Service de soutien à l'éthique de la recherche du CHUS au numéro 819-346-1110, poste 12856.

Initiales du participant : _____

CÉR chez l'humain du CHUS
APPROUVÉ 25 novembre 2012

Appendix 12. Centre de Santé et de Services Sociaux - Institut Universitaire de Gériatrie de Sherbrooke (CSSS-IUGS) Ethics Approuval Documentation

Centre de santé et de services sociaux –
Institut universitaire de gériatrie de Sherbrooke
Health and Social Services Centre –
University Institute of Geriatrics of Sherbrooke

Sherbrooke, le 13 septembre 2011

CERTIFICAT D'ÉTHIQUE
EN MATIÈRE DE RECHERCHE SUR DES HUMAINS

Le comité d'éthique de la recherche du Centre de santé et de services sociaux - Institut universitaire de gériatrie de Sherbrooke atteste :

1. Qu'il exerce ses activités de manière conforme aux bonnes pratiques cliniques;
2. Qu'aucun des membres n'était en conflit d'intérêts lors de l'évaluation des documents soumis par le chercheur;
3. Qu'il a dûment évalué et approuvé les documents qui lui ont été soumis.

Titre du projet de recherche
Mesure écologique des aptitudes de conduite d'un fauteuil roulant motorisé

La présente approbation a été demandée par : Professeur Patrick Boissy, Ph.D., Centre de recherche sur le vieillissement, CSSS-IUGS.

Le numéro de dossier attribué au projet cité en rubrique par le CÉR est le **2009-02/BOISSY**.

L'approbation éthique pour ledit projet de recherche est valide jusqu'au **30 septembre 2012**.

Monique Sullivan, Ph.D., LL. B.
Présidente

MS/lt

c. c. : Madame Julie Dubois, agente de gestion financière, Centre de recherche sur le vieillissement, CSSS-IUGS

Hôpital et centre d'hébergement D'Youville
Comité d'éthique de la recherche
1036, rue Belvédère Sud, Sherbrooke (Québec) J1H 4C4
Téléphone : 819 780-2220, poste 45386
Télécopieur : 819 829-7141
Établissement certifié par :
ACCREDITATION CANADA
AGRÉMENT CANADA
Centre affilié UNIVERSITÉ DE SHERBROOKE

Centre de santé et de services sociaux –
Institut universitaire de gériatrie de Sherbrooke
Health and Social Services Centre –
University Institute of Geriatrics of Sherbrooke

Sherbrooke, le 1er septembre 2011

Professeur Patrick Boissy, Ph. D.
Centre de recherche sur le vieillissement
CSSS - IUGS
1036, rue Belvédère Sud
Sherbrooke (Québec) J1H 4C4

Objet : Approbation finale du projet de recherche intitulé
Mobility and activity profiles following total knee arthroplasty in subjects affected by gonarthrosis: pilot study
Dossier 2011-24/BOISSY

Professeur Boissy,

Le comité d'éthique de la recherche du Centre de santé et de services sociaux-Institut universitaire de gériatrie de Sherbrooke (CSSS-IUGS) accuse réception de la documentation que vous lui avez transmise en date du 25 août 2011, cette dernière faisant référence à sa correspondance du 13 juillet 2011, laquelle vous octroyait une approbation conditionnelle au projet cité en rubrique. Ainsi, le comité a révisé les documents suivants :

- Courriel pour expliquer les modifications effectuées, daté du 25 août 2011
- Formulaire d'information et de consentement à la recherche, version 1.1, datée du 16 juillet 2011
- Dépliant pour le recrutement - Groupe expérimental, version 1.1, datée de septembre 2011
- Dépliant pour le recrutement - Groupe contrôle, version 1.1, datée de septembre 2011
- Annonce de recrutement pour les personnes qui ont subi un remplacement total du genou, non daté
- Annonce de recrutement pour les personnes qui font 30 minutes d'exercice 5 fois par semaine, non daté
- Protocole de recherche corrigé, daté du 30 mai 2011

Le projet de recherche ainsi que vos réponses et les modifications apportées ont été évalués, en comité restreint, le 1er septembre 2011. Le tout ayant été jugé satisfaisant, j'ai le plaisir de vous informer que votre projet de recherche a été approuvé par le comité d'éthique de la recherche du CSSS-IUGS.

Les documents que le comité d'éthique de la recherche du CSSS-IUGS a approuvés et que vous pouvez utiliser pour la réalisation de votre projet sont les suivants :

- Protocole de recherche intitulé « Mobility and activity profiles following total knee arthroplasty in subjects affected by gonarthrosis; pilot sutdy, daté du 30 mai 2011
- Formulaire d'information et de consentement - version 1.1, datée du 16 juillet 2011
- Annexe 1 : Test et temps de mesure

- Annexe 2 : première rencontre
  2.1 Question pour l'entrevue
  2.2 SF-12
  2.3 Montreal Cognitive Assessment (MoCA)
  2.4 Échelle de dépression gériatrique (EGD)
  2.5 Index de comorbidité fonctionnelle (ICF)
  2.6 Mobilité naturelle (WIMuGPS)
- Annexe 3 : deuxième rencontre
  3.1 Questionnaire International sur les activités physiques (IPAQ)
  3.2 Fonction du genou (Total Knee Function Questionnaire, TKFQ)
  3.3 Life Space Assessment Questionnaire - LSA-F
  3.4 Questionnaire sur la participation sociale
  3.5 SMAF - social
  3.6 Questionnaire sur les dimensions sociocommunautaire
  3.7 Statut fonctionnel du genou auto reporté (Knee Osteoarthritis Outcome Score, KOOS)
  3.8 La douleur (questionnaire douleur de Sainte-Antoine, QDSA, version française du McGill Pain Questionnaire MPQ)
- Annexe 4 : troisième rencontre
  4.1 Circonférence bio impédance et force de préhension
  4.2 Force et puissance des jambes - Test isométrique et isocinétique
  4.3 Amplitude de mouvement des genoux
  4.4 Équilibre et mobilité - 8 ft. Up and Go et test de transfert d'appui
  4.5 Force et endurance musculaire des jambes - 30 seconds chair test
  4.6 Control postural - One leg stand (OLS)
  4.7 Vitesse de marche - Test de marche de 10m
  4.8 Condition aérobique - Test de marche de 6 minutes
  4.9 Test de capacité escalatrice
- Dépliant pour le recrutement - Groupe expérimental, version 1.1, datée de septembre 2011
- Dépliant pour le recrutement - Groupe contrôle, version 1.1, datée de septembre 2011
- Annonce de recrutement pour les personnes qui ont subi un remplacement total du genou, aucune date
- Annonce de recrutement pour les personnes qui font 30 minutes d'exercice 5 fois par semaine, non daté

La présente approbation éthique est valide pour un an à compter du 1er septembre 2011, date de l'approbation finale. Deux mois avant la date d'échéance, vous devrez faire une demande de renouvellement auprès du comité d'éthique de la recherche du CSSS-IUGS en utilisant le document du comité prévu à cet effet.

En acceptant le certificat d'éthique joint en annexe, vous vous engagez à :

- Soumettre, pour approbation préalable au comité, toute demande de modification au projet de recherche ou à tout document approuvé par le comité pour la réalisation de votre projet.
- Soumettre, dès que cela est porté à votre connaissance et s'il y a lieu :
  - les réactions indésirables graves, les réactions indésirables et inattendues et les accidents observés en cours de recherche, et ce, dans les six jours ouvrables qui suivent;

- tout nouveau renseignement sur des éléments susceptibles d'affecter l'intégrité ou l'éthicité du projet de recherche ou d'accroître les risques et les inconvénients des sujets, de nuire au bon déroulement du projet ou d'avoir une incidence sur le désir d'un sujet de recherche de continuer sa participation au projet de recherche;
- toute modification constatée au chapitre de l'équilibre clinique à la lumière des données recueillies;
- la cessation prématurée du projet de recherche, qu'elle soit temporaire ou permanente;
- tout problème identifié par un tiers, lors d'une enquête, d'une surveillance ou d'une vérification interne ou externe;
- toute suspension ou annulation de l'approbation octroyée par un organisme de subvention ou de réglementation;
- toute procédure en cours de traitement d'une plainte ou d'une allégation de manquement à l'intégrité ou à l'éthique ainsi que des résultats de la procédure.

Vous retrouverez les formulaires du comité téléchargeables sur le site web du CSSS-IUGS.

La présente décision peut être suspendue ou révoquée en cas de non-respect de ces exigences. En plus du suivi administratif d'usage, le CÉR pourra effectuer un suivi actif au besoin selon les modalités qu'il juge appropriées.

En terminant, nous vous rappelons que vous devez conserver pour une période d'au moins un an suivant la fin du projet, un répertoire distinct comprenant les noms, prénoms, coordonnées, date du début et de fin de la participation de chaque sujet de recherche.

Le comité d'éthique de la recherche du CSSS-IUGS est institué par le ministre de la Santé et des Services sociaux aux fins de l'application de l'article 21 du Code civil du Québec et suit les règles émises par l'Énoncé de politique des trois conseils et les Bonnes pratiques cliniques de la CIH.

Je vous prie d'accepter, Professeur Boissy, nos meilleures salutations.

M. Sullivan

Monique Sullivan, Ph. D., LL. B.
Présidente

MS/lt

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Centre de santé et de services sociaux –
Institut universitaire de gériatrie de Sherbrooke
Health and Social Services Centre –
University Institute of Geriatrics of Sherbrooke

Sherbrooke, le 1er septembre 2011

CERTIFICAT D'ÉTHIQUE
EN MATIÈRE DE RECHERCHE SUR DES HUMAINS

Le comité d'éthique de la recherche du Centre de santé et de services sociaux - Institut universitaire de gériatrie de Sherbrooke atteste :

1. Qu'il exerce ses activités de manière conforme aux bonnes pratiques cliniques;
2. Qu'aucun des membres n'était en conflit d'intérêts lors de l'évaluation des documents soumis par le chercheur;
3. Qu'il a dûment évalué et approuvé les documents qui lui ont été soumis.

Titre du projet de recherche
Mobility and activity profiles following total knee arthroplasty in subjects affected by gonarthrosis: pilot study

La présente approbation a été demandée par : Professeur Patrick Boissy, chercheur, Centre de recherche sur le vieillissement, CSSS-IUGS.

Le numéro de dossier attribué au projet cité en rubrique par le CÉR est le **2011-24/BOISSY**.

L'approbation éthique pour ledit projet de recherche est valide jusqu'au **30 septembre 2012**.

Monique Sullivan, Ph.D., LL. B.
Présidente

MS/lt

c. c. : Madame Julie Dubois, agente de gestion financière, Centre de recherche sur le vieillissement, CSSS-IUGS

Appendix 13. Centre de Santé et de Services Sociaux - Institut Universitaire de Gériatrie de Sherbrooke (CSSS-IUGS) Information and Consent Form (Active Group)

Centre de recherche sur le vieillissement
Research Centre on Aging

Centre de santé et de services sociaux-Institut universitaire de gériatrie de Sherbrooke

FORMULAIRE D'INFORMATION ET DE CONSENTEMENT

TITRE DU PROJET DE RECHERCHE
Fonction, mobilité, activité et satisfaction suite à une arthroplastie totale du genou chez des sujets gonarthrosiques: une étude pilote d'analyse des résultats 12 à 18 mois post-opératoire.

CHERCHEURS RESPONSABLES DU PROJET
Patrick Boissy, PhD, Professeur agrégé
Département de chirurgie, FMSS
Chercheur, Centre de recherche sur le vieillissement, CSSS-IUGS.

François Cabana, M.D., Professeur titulaire
Département de chirurgie, FMSS
Chercheur, Centre de recherche sur le vieillissement, CSSS-IUGS.

Cédric Gingras-Hill, B.Sc.S Spécialisé, Mineure en gérontologie
Étudiant à la maîtrise en gérontologie
Université de Sherbrooke

FINANCEMENT DU PROJET
Les chercheurs responsables de ce projet ont les fonds nécessaires pour la réalisation de cette étude.

PRÉAMBULE
Nous sollicitons votre participation à un projet de recherche. Cependant, avant d'accepter de participer à ce projet et de signer ce formulaire d'information et de consentement, veuillez prendre le temps de lire, de comprendre et de considérer attentivement les renseignements qui suivent. Ce formulaire peut contenir des mots que vous ne comprenez pas. Nous vous invitons à poser toutes les questions que vous jugerez utiles à l'équipe de recherche et à leur demander de vous expliquer tout mot ou renseignement qui n'est pas clair.

NATURE ET OBJECTIFS DU PROJET DE RECHERCHE
La gonarthrose (arthrose aux genoux) touche un grand nombre de personnes. Parmi les modalités de traitements possibles de la gonarthrose, on retrouve traditionnellement la prise de médicaments, la physiothérapie, les exercices et les changements d'habitudes de vie, les injections articulaires et finalement la chirurgie. Ce projet de recherche s'intéresse aux effets de la chirurgie, plus précisément, à l'arthroplastie totale du genou, dans le traitement de la gonarthrose. Nous savons que l'arthroplastie totale du genou amène une réduction significative de la douleur, mais on connaît peu ses impacts sur les activités de la vie quotidienne des gens

CER du CSSS-IUGS
Approuvé par: CMS
Le: 23 janv. 2012

après la chirurgie. Nous sommes donc intéressés à en connaître un peu plus sur l'effet de cette chirurgie au niveau des profils de mobilité et d'activité des gens entre 12 à 18 mois après la chirurgie.

Pour ce faire, nous cherchons à comparer le niveau de mobilité et d'activité entre un groupe de participants en attente pour un remplacement total du genou (groupe expérimental) à un groupe de participants ayant reçu un remplacement totale du genou (groupe expérimental) et à un groupe témoin avec les mêmes caractéristiques (groupe contrôle).

Nous aimerions recruter 60 participants (20 dans chacun des groupes). Les participants doivent être âgés entre 55 et 75 ans.

Le but de cette recherche est d'explorer l'impact du remplacement total du genou sur la mobilité, la douleur et le retour aux activités régulières à la suite de la chirurgie.

Les participants du groupe expérimental devront avoir reçu une arthroplastie totale du genou dans une période minimale de 12 mois et maximale de 18 mois au moment de leur recrutement et n'avoir aucune autre chirurgie planifiée dans les six prochains mois.

Les participants du groupe contrôle devront être en santé et être actifs dans la communauté.

De plus, nous aimerions inclure un groupe de 20 sujets, âgés de 18 à 35 ans, en santé, qui serviront comme groupe de comparaison pour les données écologiques. Ces sujets auront seulement à porter le WIMuGPS pour une durée de 2 semaines et répondre à 5 questionnaires qui portent sur le statut fonctionnel, l'espace de vie, le niveau d'activité, la participation sociale et les dimensions sociaux communautaires.

Le but de cette recherche est d'explorer l'impact de l'arthroplastie totale du genou sur la mobilité, la douleur et le retour aux activités régulières à la suite de la chirurgie.

DÉROULEMENT DU PROJET DE RECHERCHE

Votre participation à ce projet de recherche implique trois rencontres, d'environ une heure et demi chacune.

Première rencontre

Lors de la première rencontre, un assistant de recherche se rendra, sur rendez-vous, selon vos disponibilités, à votre domicile pour une entrevue, vous faire compléter une série de questionnaires et pour vous expliquer le fonctionnement de l'appareil que vous devrez porter pour 14 heures consécutives, pendant 14 jours consécutifs. L'entrevue ne sera faite qu'auprès des participants ayant eu une arthroplastie totale du genou (groupe expérimental). Les thèmes abordés lors de l'entrevue porteront sur

CER du CSSS-IUGS
Approuvé par: CM
Le: 23.01.2012

la satisfaction envers les résultats de l'opération et les symptômes ou difficultés fonctionnelles résiduelles. L'appareil, nommé le WIMuGPS, mesure 4,5 cm de largeur par 7,2 cm de longueur et a une épaisseur de 1,6 cm. Le WIMuGPS permettra de mesurer votre niveau d'activité et d'espace de vie. Cette visite durera environ une heure.

Les quatre questionnaires de cette rencontre nous informeront sur des variables de contrôle pour l'étude. Ces dernières sont: 1) la santé cognitive; 2) les symptômes dépressifs; 3) le taux de comorbidités; et 4) le statut fonctionnel. Le questionnaire portant sur le statut fonctionnel sera complété par les deux groupes mais déterminera l'admissibilité des sujets dans le groupe contrôle seulement. Cette rencontre servira aussi comme séance d'enseignement pour vous expliquer le fonctionnement du dispositif que vous porterez (comment le porter, où le brancher, etc.). Ce dispositif est similaire à un podomètre et servira à mesurer l'orientation de votre corps dans l'espace (si vous êtes couché, assis, debout ou en mouvement) et permettra aussi de calculer les distances que vous parcourrez par rapport à votre domicile. Nous saurons, aussi, si les déplacements sont faits à pied ou par un autre moyen de transport (par exemple en voiture). Même si la composante GPS du dispositif nous permet de localiser des endroits spécifiques que vous visitez, nous ne nous intéressons pas à examiner les endroits visités, mais plutôt, les distances parcourues à partir de votre domicile.

Deuxième rencontre

Sept jours plus tard, l'assistant de recherche reviendra, sur rendez-vous et selon vos disponibilités, à votre domicile pour compléter une deuxième série de questionnaires, vérifier le fonctionnement de l'appareil et répondre à vos questions. Les questionnaires seront centrés sur le niveau d'activité, l'espace de vie et la participation sociale. Cette visite durera environ une heure.

Troisième rencontre

La dernière rencontre aura lieu sept jours après la deuxième rencontre, au Centre de recherche sur le vieillissement (CDRV) pour des mesures de vos capacités. Vous serez soumis à un examen de la force des muscles de vos jambes grâce à un appareil de dynamométrie, la mesure d'amplitude de mouvement de votre genou, deux tests d'équilibre et mobilité, un test de force musculaire des jambes, un test de contrôle postural (effectué sur la jambe opérée et la jambe non opérée), un test de vitesse de marche, un test de marche normale de six minutes et finalement, un test de capacité escalatrice. La circonférence de vos hanches et votre taille sera prise avec un ruban à mesurer et votre bio impédance (composition corporelle) sera prise. De plus, votre force de préhension des mains sera évaluée à l'aide d'un dynamomètre.

L'appareil sera remis à la fin de la rencontre qui durera environ deux heures. Vous ne serez pas tenu responsable s'il arrive un bris à l'équipement.

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Dans le cas d'un problème technique rendant impossible l'utilisation des données recueillis par le WIMuGPS, il se peut que nous vous recontactions pour une collecte supplémentaire (7 jours).

RISQUES ASSOCIÉS AU PROJET DE RECHERCHE

Il est possible que vous ressentiez des douleurs musculaires ou articulaires à la suite des tests cliniques, surtout si vous n'avez pas l'habitude d'en faire. Ces inconforts devraient être passagers. Bien que nous prenions des précautions tels qu'un réchauffement, une supervision et un enseignement minutieux des tests, il existe une possibilité de vous blesser pendant la réalisation d'un de ces tests. Par exemple, un gonflement articulaire du genou ou une douleur tendineuse. Il existe, aussi, une possibilité de risques inattendus ou imprévisibles.

INCONVÉNIENTS

Vous devrez vous déplacer au CDRV.
Vous devrez consacrer du temps à faire les différents tests et remplir les questionnaires.
Vous aurez à porter un appareil au tronc à journée longue (14 heures consécutives), pendant 14 jours.
L'appareil au tronc nécessitera d'être rechargé chaque nuit.

AVANTAGES

Il se peut que vous retiriez un bénéfice personnel de votre participation à ce projet de recherche, mais on ne peut vous l'assurer. Par ailleurs, les résultats obtenus contribueront à l'avancement des connaissances dans ce domaine.

PARTICIPATION VOLONTAIRE ET POSSIBILITÉ DE RETRAIT

Votre participation à ce projet de recherche est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de ce projet à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision à l'équipe de recherche. Le chercheur peut retirer le participant à n'importe quel moment.

Si vous vous retirez ou si vous êtes retiré du projet, l'information déjà obtenue dans le cadre de ce projet sera conservée selon les modalités décrites à la rubrique Confidentialité. Toute nouvelle connaissance acquise durant le déroulement du projet qui pourrait affecter votre décision de continuer d'y participer vous sera communiquée sans délai, verbalement et par écrit.

CONFIDENTIALITÉ

Durant votre participation à ce projet, les chercheurs responsables et l'équipe de recherche recueilleront et consigneront dans un dossier de recherche des

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renseignements qui vous concernent. Seuls ceux qui sont strictement nécessaires pour répondre aux objectifs scientifiques du projet seront recueillis et utilisés à des fins de recherche.
Ces renseignements (données) comprendront les informations suivantes :

- Votre nom, votre adresse, votre sexe et votre date de naissance
- Vos habitudes de vie
- Les résultats de tous les tests, examens et procédures que vous aurez à faire durant ce projet

Toutes ces données demeureront strictement confidentielles, dans les limites prévues par la loi. Afin de préserver votre identité et la confidentialité des renseignements recueillis, vous serez identifié par un numéro de code. La clé du code reliant votre nom à votre dossier de recherche sera conservée exclusivement par les chercheurs responsables.

À la fin du projet de recherche, les données informatiques seront anonymisées, c'est-à-dire qu'il sera impossible de lier les données à votre nom, prénom, coordonnées ou date de naissance. La clé de code aura été détruite. Ainsi, les données de recherche pourront :

- Être publiées dans des revues spécialisées
- Faire l'objet de discussions scientifiques
- Servir pour d'autres analyses reliées au projet
- Servir pour l'élaboration de projets de recherche futurs.

Concernant votre dossier de recherche (documents papier), ce dernier sera détruit à l'exception de vos renseignements personnels (votre nom et vos coordonnées) qui seront conservés durant 5 ans après la fin du projet et détruits par la suite selon les normes en vigueur au CSSS-IUGS.

- Durant cette période de 5 ans, dans l'éventualité où des projets de recherche similaires à celui-ci se réaliseraient, acceptez-vous qu'un membre de l'équipe de recherche prenne contact avec vous pour vous proposer une nouvelle participation ? Bien sûr, lors de cet appel, vous seriez entièrement libre d'accepter ou de refuser de participer.
  Oui ❑ Non ❑

Les personnes suivantes pourront consulter votre dossier de recherche :

- Vous-même, pour vérifier les renseignements recueillis et les faire rectifier au besoin et ce, aussi longtemps que le chercheur responsable ou le CSSS-IUGS détiennent ces informations.
- Une personne mandatée par le Comité d'éthique de la recherche du CSSS-IUGS ou par des organismes publics autorisés et ce, à des fins de surveillance et de

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contrôle. Toutes ces personnes et organismes adhèrent toutes à une politique de confidentialité.

INDEMNISATION EN CAS DE PRÉJUDICE ET DROITS DU SUJET DE RECHERCHE
Si vous deviez subir quelque préjudice que ce soit dû à votre participation au projet de recherche, vous recevrez tous les soins et services requis par votre état de santé, sans frais de votre part. Le Centre de recherche sur le vieillissement possède une assurance responsabilité civile et professionnelle pour ses intervenants.

En acceptant de participer à ce projet, vous ne renoncez à aucun de vos droits, ni ne libérez les chercheurs ou le CSSS-IUGS de leur responsabilité civile et professionnelle.

COMPENSATION
Vous recevrez une somme forfaitaire de 45 dollars en compensation des frais encourus et des contraintes subies. Cette somme vous sera versée à la fin de l'étude Si vous vous retirez ou si vous êtes retiré du projet avant qu'il ne soit complété, vous recevrez un montant proportionnel à votre participation.

Le groupe de comparaison ne recevra aucune compensation puisque les sujets n'ont pas à se déplacer pour l'étude.

IDENTIFICATION DES PERSONNES RESSOURCES
Si vous avez des questions concernant le projet de recherche ou si vous éprouvez un problème que vous croyez relié à votre participation au projet de recherche, vous pouvez communiquer avec les chercheurs responsables du projet de recherche au numéro suivant : Patrick Boissy : 819 780-2220 poste 45628 et Cédric Gingras-Hill : 819 571-4636.

Pour toute question concernant vos droits en tant que sujet participant à ce projet de recherche ou si vous avez des plaintes ou des commentaires à formuler, vous pouvez communiquer avec le Commissaire local aux plaintes et à la qualité des services au numéro suivant : 819 780-2220, poste 40204.

SURVEILLANCE DES ASPECTS ÉTHIQUES DU PROJET DE RECHERCHE
Le Comité d'éthique de la recherche du CSSS-IUGS a approuvé ce projet de recherche et en assure le suivi annuel. De plus, il approuvera au préalable toute révision et toute modification apportées au formulaire d'information et de consentement et au protocole de recherche.

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Journal Encrâge

Le Journal Encrâge est un bulletin publié par le Centre de recherche sur le vieillissement du CSSS-IUGS deux fois par année. Il vise à informer les personnes qui ont participé aux études du Centre de recherche et la communauté régionale.

Souhaitez-vous recevoir une copie de ce journal ?
Oui ❑ Non ❑

PROFILS DE MOBILITÉ ET ACTIVITÉ POST ARTHROPLASTIE DU GENOU: ÉTUDE PILOTE COMPARATIVE

CONSENTEMENT DU PARTICIPANT

J'ai lu et compris le présent formulaire d'information et de consentement.
Je reconnais qu'on m'a expliqué le projet, qu'on a répondu à mes questions et qu'on m'a laissé le temps voulu pour prendre une décision.

Je consens à participer à ce projet de recherche aux conditions qui y sont énoncées. Un exemplaire signé et daté du présent formulaire d'information et de consentement me sera remis.

_____

Nom et signature du participant Date

Autorisation de transmettre les résultats

Il se peut que les résultats de ce projet puissent avoir une utilité clinique pour votre médecin traitant.
Autorisez-vous les chercheurs à informer votre médecin traitant de votre participation à ce projet :
Oui ❒ Non ❒

Autorisez-vous les chercheurs à transmettre à votre médecin traitant les informations pertinentes, si ces informations peuvent avoir une utilité clinique :
Oui ❒ Non ❒

Nom et adresse de votre médecin traitant :
_____

Dans l'éventualité que vous n'auriez pas de médecin traitant, nous vous référerons au CSSS-IUGS.

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SIGNATURE DE LA PERSONNE QUI A OBTENU LE CONSENTEMENT
J'ai expliqué au sujet de recherche les termes du présent formulaire d'information et de consentement et j'ai répondu aux questions qu'il m'a posées.

Nom et signature de la personne qui obtient le consentement Date

SIGNATURE ET ENGAGEMENT D'UN CHERCHEUR RESPONSABLE DU PROJET
Je m'engage avec l'équipe de recherche à respecter ce qui a été convenu au présent formulaire d'information et de consentement et à en remettre un exemplaire signé au participant.

Nom et signature d'un chercheur responsable du projet de recherche Date

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Le: 23-01-2012

Appendix 14. Pre-TKA and Post-TKA Clinical Recruitment Form

CENTRE HOSPITALIER UNIVERSITAIRE DE SHERBROOKE
Hôpital Fleurimont, 3001, 12e Avenue Nord, Fleurimont (Québec) J1H 5N4
Hôtel-Dieu, 580, rue Bowen Sud, Sherbrooke (Québec) J1G 2E8
Téléphone : (819) 346-1110

Projet étude sur la fonction, mobilité et satisfaction suite à une prothèse totale du genou.

Madame, Monsieur,

Nous vous invitons à participer à un projet de recherche parce que soit vous devez subir une chirurgie de remplacement de l'articulation de votre genou ou en avez subi une récemment.

Le but de cette étude est d'explorer l'impact du remplacement total du genou sur la mobilité, la douleur et sur le retour aux activités régulières à la suite de la chirurgie. Les résultats obtenus contribueront à un meilleur pronostique et à l'avancement des connaissances dans ce domaine. Pour ce faire, nous aimerions comparer3 groupes:
1) Individus avec arthrose du genou en attente d'un remplacement total du genou;
2) Individus ayant eu récemment (6-18 mois) recours au remplacement total du genou; et
3)Individus sans douleurs aux genoux ni autres troubles de mobilité.

Si vous êtes intéressé(e) à recevoir de l'information plus détaillée sur ce projet vous pouvez contacter l'assistant de recherche, Cédric Gingras-Hill :
1. par téléphone au numéro suivant : **819 571-4636**
2. par courriel à l'adresse suivante : **cedric.gingras-hill@usherbrooke.ca**
3. ou en remplissant et en détachant le coupon réponse ci-dessous puis le remettre à la réceptionniste dans l'enveloppe ci-jointe. Dès réception de ce courrier, Cédric Gingras-Hill vous contactera pour vous donner des précisions sur le projet.

Sachez que cette étude n'interfère pas avec les soins que vous recevez et que cet appel téléphonique ne vous engage à rien et soyez assuré(e) que peu importe votre réponse, la qualité des soins prodigués sera identique.

Merci d'avance pour votre collaboration.

Dr François Cabana Chirurgien orthopédique Chercheur principal du projet	Cédric Gingras-Hill Assistant de recherche chargé du projet

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Je consens librement à recevoir un appel téléphonique de l'assistant de recherche pour l'explication du projet de recherche :

Nom du patient : Signature :	Téléphone : Date :

CÉR chez l'humain du CHUS
APPROUVÉ 28 mai 2012 BJ